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MINERAL COMMODITY SUMMARIES 2026

Abrasives
Aluminum
Antimony
Arsenic
Asbestos
Barite
Bauxite
Beryllium
Bismuth
Boron
Bromine
Cadmium
Cement
Cesium
Chromium
Clays
Cobalt
Copper
Diamond
Diatomite
Feldspar
Fluorspar
Gallium
Garnet
Gemstones
Germanium
Gold
Graphite
Gypsum
Hafnium
Helium
Indium
Iodine
Iron and Steel
Iron Ore
Iron Oxide Pigments
Kyanite
Lead
Lime
Lithium
Magnesium
Manganese
Mercury
Mica
Molybdenum
Nickel
Niobium
Nitrogen
Palladium
Peat
Perlite
Phosphate Rock
Platinum
Potash
Pumice
Quartz
Rare Earths
Rhenium
Rubidium
Salt
Sand and Gravel
Scandium
Selenium
Silicon
Silver
Soda Ash
Stone
Strontium
Sulfur
Talc
Tantalum
Tellurium
Thallium
Thorium
Tin
Titanium
Tungsten
Vanadium
Vermiculite
Wollastonite
Yttrium
Zeolites
Zinc
Zirconium

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U.S. Department of the Interior
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Cover: Molten copper being poured into anode molds at Freeport-McMoRan Inc.'s smelter in Miami, AZ. Each solidified copper anode weighs approximately 390 kilograms and is about five centimeters (cm) thick, 90 cm wide, and 110 cm tall. Cast anodes, which consist of 99.8% copper, are shipped to an electrolytic refinery to be further processed into cathodes with a copper purity of >99.99%. The green and blue gases visible over the flowing molten copper are a result of fine copper oxide particles or trace amounts of copper vapor and impurities reacting with moisture, oxygen, and other chemical compounds (like carbon dioxide) in the atmosphere to form various copper salts. Copper (p. 72–73) has the lowest resistivity and highest electrical conductivity of all non-precious metals. It is widely used in electrical applications across a broad range of products, such as appliances, automobiles, building wire, data transmission lines, generators, lighting, microprocessors, motors, personal electronic devices, power and telecommunications cables, renewable energy systems (geothermal, solar, and wind), and transformers. In 2025, copper was designated as a critical mineral by the U.S. Geological Survey. The United States was the sixth-ranked global producer of both mined and refined copper. Cover design by Daniel M. Flanagan and Abraham J. Padilla, U.S. Geological Survey. Photograph by Daniel M. Flanagan, used with permission from Freeport-McMoRan Inc.

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Gemstones
Germanium
Gold
Graphite
Gypsum
Hafnium
Helium
Indium
Iodine
Iron and Steel
Iron Ore
Iron Oxide Pigments
Kyanite
Lead
Lime
Lithium
Magnesium
Manganese
Mercury
Mica
Molybdenum
Nickel
Niobium
Nitrogen
Palladium
Peat
Perlite
Phosphate Rock
Platinum
Potash
Pumice
Quartz
Rare Earths
Rhenium
Rubidium
Salt
Sand and Gravel
Scandium
Selenium
Silicon
Silver
Soda Ash
Stone
Strontium
Sulfur
Talc
Tantalum
Tellurium
Thallium
Thorium
Tin
Titanium
Tungsten
Vanadium
Vermiculite
Wollastonite
Yttrium
Zeolites
Zinc
Zirconium

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U.S. Geological Survey

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FOREWORD

The annual U.S. Geological Survey (USGS) Mineral Commodity Summaries (MCS) is the most authoritative statistical publication on U.S. and global mineral production, consumption, and trade. The MCS as we know it today received its first public release under the U.S. Bureau of Mines in 1978 and transitioned to the USGS in 1996. During the subsequent 30 years, the USGS has maintained and built on the MCS, preserving its historical continuity while modernizing methods, coverage, and dissemination. The MCS continues to provide a consistent, transparent, and trusted record of mineral information for government policymakers as well as for academia, industry, and the public.

Because of this continuity, reviewing past volumes of the MCS tells some important stories very clearly. One is the increasing importance of minerals in our lives and the world economy. In the 1996 MCS, before the first smartphone or hybrid car or lawnmower was powered by a lithium-ion battery, world lithium production outside the United States was 6,100 tons in 1994. Estimated world lithium production increased to 290,000 tons in 2025. In the 1996 MCS, a decade before the F–35 fighter plane first flew with rare-earth-element magnets in many components, world production of rare earth elements in 1994 was 64,500 tons. World production of rare earth elements was estimated to have increased to 390,000 tons in 2025. The 1996 MCS showed that the United States was the dominant producer of lithium and a close second to China in rare-earth-element production. Today, the United States relies on imports for more than one-half of the lithium and more than two-thirds of the rare-earth compounds and metals it consumes.

In 2017, USGS Professional Paper 1802, “Critical Mineral Resources of the United States—Economic and Environmental Geology and Prospects for Future Supply,” explained how minerals are described as critical. The same year, President Trump signed Executive Order 13817, “A Federal Strategy To Ensure Secure and Reliable Supplies of Critical Minerals,” and set the Nation on a path to analyze and mitigate risks of critical mineral supply chain disruptions, an effort that has continued and expanded in this administration. The USGS contributes to these efforts by forecasting the risks that supply chain disruptions pose to the U.S. economy and national security, maintaining the whole-of-government List of Critical Minerals as one way to communicate those risks, and continually scanning the horizon for additional emerging vulnerabilities in mineral supply chains. In addition, the USGS Earth Mapping Resources Initiative (Earth MRI) is remapping the Nation using cutting-edge surveying instruments—and novel artificial intelligence techniques—to update our understanding of the domestic resource base and its potential role in the future economy. To all these efforts, we bring the same rigorous, Gold Standard scientific integrity and expertise that results in the mineral commodity statistics presented here.

In recent years, the national and global context for mineral resources has evolved significantly. Critical minerals have become central in U.S. Government policymaking and international relations. In 2025, the minerals industries contributed more than $4 trillion to the U.S. economy, and clearly minerals will be the lifeblood of the 21st century global economy. Issues related to supply chains, critical minerals, and materials security have taken on increased importance for economic resilience, technological advancement, and national security. In response, the USGS has expanded its research portfolio to better understand mineral supply, demand, and vulnerability. This work includes the Minerals Yearbooks and the World Minerals Outlook series. The USGS’s diverse mineral resources portfolio also includes landmark publications that address the whole life cycle of critical minerals, including supply chain studies, mapping and assessment of domestic and global resources, and investigations of the potential to recover critical minerals from mine waste.

This edition of the MCS includes updates to figures and tables in the front matter, along with a new digital companion to the MCS. These updated ways to present and access the MCS data are made possible by the sustained commitment and expertise of the scientists, statisticians, economists, and analysts of the National Minerals Information Center, whose work ensures the reliability and credibility of USGS mineral data. Their stewardship maintains the continuity of a statistical record that spans generations of mineral information work within the Federal Government.

It is my great pleasure to lead the USGS and oversee the publication of these important mineral resource milestone reports. I encourage readers to use the Mineral Commodity Summaries alongside those other U.S. Geological Survey publications, to gain a comprehensive understanding of mineral resources, supply chains, and the challenges and opportunities they present.

Ned Mamula
Director, U.S. Geological Survey

CONTENTS

INSTANT INFORMATION

Information about the U.S. Geological Survey, its programs, staff, and products is available from the internet at https://www.usgs.gov or by calling (888) ASK–USGS [(888) 275–8747].

This publication has been prepared by the National Minerals Information Center (NMIC). Information about NMIC and its products is available from the internet at https://www.usgs.gov/centers/national-minerals-information-center or by writing to Director, National Minerals Information Center, 988 National Center, Reston, VA 20192.

KEY PUBLICATIONS

Minerals Yearbook—These annual publications review the mineral industries of the United States and of more than 180 other countries and localities. They contain statistical data on minerals and materials and include information on economic and technical trends and developments and are available at https://www.usgs.gov/centers/national-minerals-information-center/publications. The three volumes that make up the Minerals Yearbook are volume I, Metals and Minerals; volume II, Area Reports—Domestic; and volume III, Area Reports—International.

Mineral Commodity Summaries—Published on an annual basis, this report is the earliest Government publication to furnish estimates covering nonfuel mineral industry data and is available at https://www.usgs.gov/centers/national-minerals-information-center/mineral-commodity-summaries. Data sheets contain information on the domestic industry structure, Government programs, tariffs, world production and reserves, and 5-year salient statistics for more than 90 individual minerals and materials.

Mineral Industry Surveys—These periodic statistical and economic reports are designed to provide timely statistical data on production, shipments, stocks, and consumption of significant mineral commodities and are available at https://www.usgs.gov/centers/national-minerals-information-center/mineral-industry-surveys. The surveys are issued monthly, quarterly, or at other regular intervals.

Materials Flow Studies—These publications describe the flow of minerals and materials from extraction to ultimate disposition to help better understand the economy, manage the use of natural resources, and protect the environment and are available at https://www.usgs.gov/centers/national-minerals-information-center/materials-flow.

Recycling Reports—These studies illustrate the recycling of metal commodities and identify recycling trends and are available at https://www.usgs.gov/centers/national-minerals-information-center/recycling-statistics-and-information.

Historical Statistics for Mineral and Material Commodities in the United States (Data Series 140)—This report provides a compilation of statistics on production, trade, and use of approximately 90 mineral commodities since as far back as 1900 and is available at https://www.usgs.gov/centers/national-minerals-information-center/historical-statistics-mineral-and-material-commodities.

WHERE TO OBTAIN PUBLICATIONS

- *Mineral Commodity Summaries* and the *Minerals Yearbook* are sold by the U.S. Government Publishing Office. Orders are accepted over the internet at https://bookstore.gpo.gov, by email at ContactCenter@gpo.gov, by telephone toll free (866) 512–1800; Washington, DC, area (202) 512–1800, by fax (202) 512–2104, or through the mail (P.O. Box 979050, St. Louis, MO 63197–9000).

- All current and many past publications are available as downloadable Portable Document Format (PDF) files through https://www.usgs.gov/centers/national-minerals-information-center.

- Data visualization tools can be accessed at https://apps.usgs.gov/critical-minerals/mineral-commodities-2026.html.

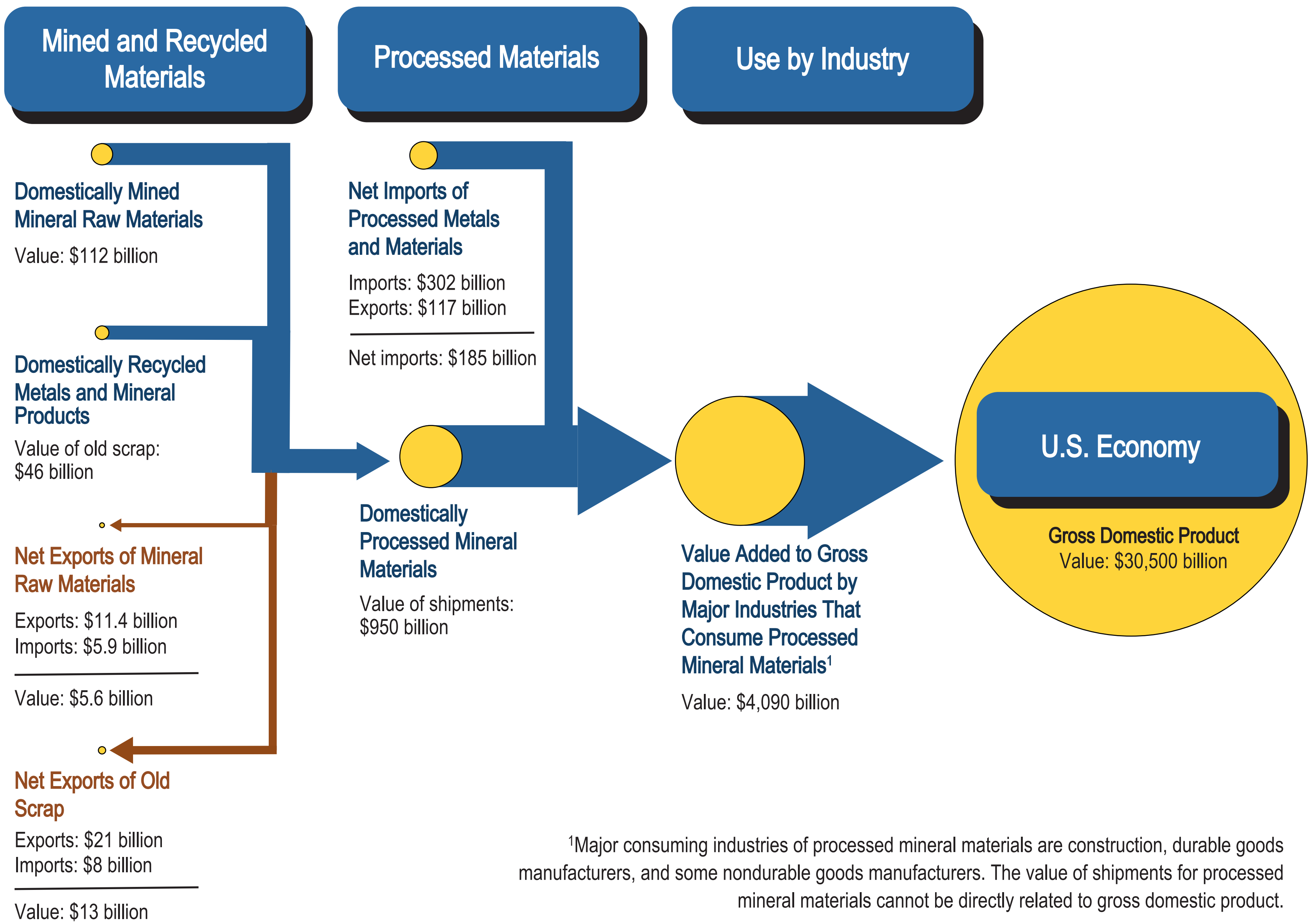
INTRODUCTION

Each mineral commodity chapter of the 2026 edition of the U.S. Geological Survey (USGS) Mineral Commodity Summaries (MCS) includes information on events, trends, and issues for each mineral commodity as well as discussions and tabular presentations on domestic industry structure, Government programs, tariffs, 5-year salient statistics, and world production, reserves, and resources. The MCS is the earliest comprehensive source of 2025 mineral production data for the world. More than 90 individual minerals and materials are covered by two-page synopses.

Abbreviations and units of measure and definitions of selected terms used in the report are in Appendix A and Appendix B, respectively. Reserves and resources information is in Appendix C, which includes “Part A—Resource and Reserve Classification for Minerals” and “Part B—Sources of Reserves Data.” A directory of USGS minerals information country specialists and their responsibilities is in Appendix D.

The USGS continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the 2026 MCS are welcomed.

Figure 1.—The Role of Nonfuel Mineral Commodities in the U.S. Economy



[1]Major consuming industries of processed mineral materials are construction, durable goods manufacturers, and some nondurable goods manufacturers. The value of shipments for processed mineral materials cannot be directly related to gross domestic product.

Sources: U.S. Geological Survey and U.S. Department of Commerce

SIGNIFICANT EVENTS, TRENDS, AND ISSUES

In 2025, the estimated total value of nonfuel mineral production in the United States was $112 billion compared with $106 billion in 2024. The estimated value of metal production in 2025 increased by 13% to $38.1 billion from a revised total of $33.6 billion in 2024. The total estimated value of industrial minerals production was $73.7 billion, 2% more than the revised total of $72.2 billion in 2024 (table 1). Of the total value of industrial minerals production, an estimated $39.4 billion was natural aggregates production (construction sand and gravel and crushed stone), a 4% increase from that in 2024, and other industrial minerals production value was an estimated $34.3 billion, compared with $34.2 billion in 2024. Crushed stone was the leading nonfuel mineral commodity in 2025, with an estimated production value of $26.8 billion, and accounted for 24% of the total estimated value of U.S. nonfuel mineral production.

In 2025, prices in the minerals sector were mixed. At the global level, prices for bismuth increased by 270%, and prices for antimony and germanium metal increased by 144% and 106%, respectively. Conversely, notable price declines included lithium by 24%, manganese by 19%, and nickel by 11%. In the United States, the production value of lithium decreased by 16%, but the production values of cobalt and nickel (which are used to make lithium-ion batteries) increased by 80% and 19%, respectively, compared with production values in 2024.

Production quantities in the United States for cobalt and nickel increased by 50% and 34%, respectively, but lithium production was unchanged compared with production quantities in 2024. Cadmium and molybdenum also had significant percentage increases in production quantities in the United States compared with production in 2024. In the United States, the largest decreases in metal production quantities, in descending order, were palladium, platinum, iron ore, lead, and zinc.

Gold and silver, however, had some of the highest prices on record in 2025 leading to increased production values. The prices of gold and silver increased by 38% and 34%, respectively. The estimated production value of gold increased by 32% despite the estimated quantity of gold produced decreasing by 2% compared with that in 2024. The estimated production value of silver increased by 43%, and the quantity of silver produced increased by 5% compared with that in 2024.

For the industrial minerals sector, the production value of natural aggregates, which comprised approximately 60% of the total production value of all industrial minerals, increased by 4% even though production volumes decreased by 1% in 2025 compared with production in 2024. For industrial minerals overall, production value increased from $72.3 billion in 2024 to $73.7 billion in 2025. The largest percentage increases in production value in 2025, in descending order, were for dimension stone, wollastonite, potash, mica, and portland cement. The largest percentage decreases, in ascending order, were for high purity quartz, industrial sand and gravel, lithium carbonate, bromine, and boron.

In 2025, the leading domestic cadmium-telluride (CdTe) solar panel manufacturer began production at a fifth facility, which was expected to increase domestic capacity to about 14 gigawatts per year once it reaches full capacity in 2026. In October, a company started mining antimony ore from a mine in Montana and another company started construction of a mine in Idaho to produce antimony ore. There has not been significant antimony mine production in the United States since 2001.

In the iron and steel sector, one company announced in December 2024 that construction would restart at a 7-million-ton-per-year-production-capacity iron mine and pelletizing plant project in Minnesota with startup expected in early 2026. In March 2025, another company with iron ore mines in Minnesota idled one mine indefinitely and partially idled production at another mine. The two mines have a combined rated capacity of 10 million tons per year. Total operational iron ore capacity at the end of 2025 was estimated to have been 40.2 million tons per year. In June, a domestic steel manufacturer completed a deal to be acquired by a Japan-based steel company, which was approved by the U.S. Government with stipulations. The new owner expected to make $11 billion in domestic steelmaking investments through 2028.

Citing strategic capacity adjustments to account for product-specific market conditions, another steel company indefinitely idled multiple facilities, including a basic oxygen furnace and mill in Illinois with an annual production capacity of 700,000 tons of hot-rolled coil products; a basic oxygen furnace and continuous casting facility in Michigan with an annual production capacity of 1.99 million tons of pig iron and 2.40 million tons of carbon slabs, advanced high-strength steels, and other products; and a mini-mill in Pennsylvania with an annual production capacity of 300,000 tons of rail and other products. The Pennsylvania company also restarted a blast furnace in Ohio with an annual production capacity of 1.37 million tons of pig iron.

In the rare earths sector, a mining and processing facility in California expanded separation and processing capacity in 2025. A company based in New Hampshire expanded capacity to manufacture rare earth metals, and a rare earth separation company based in Louisiana progressed toward commercial-scale production.

The U.S. Geological Survey (USGS) published the "Final 2025 List of Critical Minerals" in the Federal Register (90 FR 50494), which includes 60 mineral commodities. In 2025, there were many initiatives and projects in response to previously passed legislation and Executive actions to advance securing American supply chains and supporting domestic production projects. See the "U.S. Critical Minerals Update" section beginning on page 24 for more details.

U.S. Production and Consumption

As shown in figure 1 and table 1, minerals remained fundamental to the U.S. economy, contributing to the real gross domestic product at several levels, including mining, processing, and manufacturing finished products.

The estimated value of nonfuel minerals produced at mines in the United States in 2025 was $112 billion, an increase of 6% from production in 2024. Domestic raw materials and domestically recycled materials were used to produce mineral materials worth $950 billion. These mineral materials as well as $185 billion in net imports of processed mineral materials were, in turn, consumed by downstream industries creating an estimated value of $4.09 trillion in 2025, compared with the revised value of $4.06 trillion in 2024.

The nonfuel minerals sector was also a substantial employer. According to the U.S. Bureau of Labor Statistics, the nonfuel mining and related sectors (excluding coal mining) employed an estimated 1.82 million people in 2025, consisting of 150,000 employees in nonfuel mining; 900,000 employees in chemicals and allied products; 410,000 employees in stone, clay, and glass products; and 360,000 employees in primary metal industries. Weekly earnings in the nonfuel mineral processing sector, excluding coal, averaged an estimated $1,900 in 2025, a slight increase from that in 2024.

Figure 2 illustrates the reliance of the United States on foreign sources for raw and processed mineral materials. In 2025, imports made up more than one-half of the U.S. apparent consumption for 54 nonfuel mineral commodities, and the United States was 100% net import reliant for 16 of those. Of the 58 mineral commodities included in the Final 2025 List of Critical Minerals (excluding metallurgical coal and uranium), the United States was 100% net import reliant for 13 mineral commodities, and an additional 20 critical mineral commodities (including 14 lanthanides, which are listed under rare earths) had a net import reliance greater than 50% of apparent consumption.

Figure 3*A* shows the countries that were sources in 2021–24 of critical minerals for which the United States was greater than 50% net import reliant in 2025 and the leading suppliers of those mineral commodities. China was the leading supplier of eight of these mineral commodities and was a major supplier of six others. Canada was a major supplier of 16 of these mineral commodities, including 4 for which Canada was the leading supplier. Germany was a major supplier of eight of these mineral commodities; Japan, Mexico, and South Africa, six mineral commodities each; and Brazil, three mineral commodities.

The estimated value of U.S. metal mine production in 2025 was $38.1 billion, an increase of 13% from the value in 2024 (table 1). In 2025, the capacity utilization for the metal mining industry remained unchanged at 57% after declining in previous years (table 2). Principal contributors to the total value of metal mine production in 2025 were gold, 43%; copper, 29%; iron ore, 9%; zinc, 6%; and molybdenum, 5%.

The estimated value of U.S. industrial minerals production in 2025, including natural aggregates, was $73.7 billion, 2% more than that in 2024 (table 1). In 2025, the capacity utilization for the nonmetallic minerals mining industry increased to 85% compared with the revised capacity utilization of 83% in 2024 (table 2). The value of industrial minerals production in 2025 was led by crushed stone, 36%; cement (masonry and portland), 18%; construction sand and gravel, 17%; and industrial sand and gravel, 6%.

In 2025, U.S. production of 14 mineral commodities was valued at more than $1 billion each and together the estimated production value accounted for 92% of the total estimated value of production. These commodities were, in decreasing order of value, crushed stone, gold, construction sand and gravel, portland cement, copper, industrial sand and gravel, lime, iron ore, salt, zinc, molybdenum, phosphate rock, soda ash, and silver.

In 2025, 9 States had more than $3 billion worth of publishable nonfuel mineral commodities production value, and another 14 States had more than $1.5 billion (fig. 4). The top 10 producing States (based on total value including withheld values) were, in descending order of production value, Nevada, Arizona, Texas, Alaska, California, Florida, Utah, Missouri, Minnesota, and Michigan (table 3).

The West was the leading region in the production of metals and metallic minerals; the estimated value was $32.8 billion in 2025 (fig. 5). The South was the leading region in the production of industrial minerals (excluding construction sand and gravel and crushed stone); the estimated value was $16 billion in 2025 (fig. 6).

In 2025, eight States produced more than $1 billion worth of crushed stone. These States were, in descending order of production value, Texas, Pennsylvania, North Carolina, Florida, Georgia, Tennessee, Virginia, and Ohio. There were an additional eight States with more than $500 million worth of crushed stone production (fig. 7).

Construction sand and gravel was produced in every State. California and Texas each produced more than $1 billion worth of construction sand and gravel in 2025, and Arizona, New York, Washington, and Utah each produced more than $500 million. Colorado, Florida, Ohio, and Michigan, in descending order of production value, were the other top 10 producing States (fig. 8).

In 2025, the percentage change in U.S. consumption was mixed. Apparent consumption decreased for 25 mineral commodities, increased for 46 mineral commodities, and remained unchanged for 10 mineral commodities. Notable mineral commodities with decreased consumption in 2025 compared with 2024, in ascending order from the largest decrease, included asbestos, gemstones, yttrium, arsenic, and gold. In descending order, mineral commodities with the largest percentage increase in consumption were strontium, rare earths, thallium, antimony, tantalum, palladium, silver, platinum, and rhenium (fig. 11).

For the 5-year period from 2021 through 2025, consumption declined for many mineral commodities indicating substitution of the material or potentially less domestic production of downstream products that required the raw mineral commodities. Over the past 5 years, consumption decreased for 41 materials, increased for 35 materials, and remained unchanged for 5 materials. The largest decreases (greater than 25%) in consumption, in ascending order from the largest decrease, were for asbestos, gemstones, yttrium, gold, bauxite, mica, and diatomite. The largest increases (greater than 25%) in consumption, in descending order from the largest increase, were for thallium, rare earths, titanium metal, strontium, platinum, antimony, graphite (natural), palladium, vanadium, cobalt, indium, sand and gravel (industrial), niobium, tantalum, and garnet (industrial) (fig. 12).

The Defense Logistics Agency Strategic Materials (DLA Strategic Materials) is responsible for the operational oversight of the National Defense Stockpile (NDS). DLA Strategic Materials is the leading U.S. agency for the analysis, planning, procurement, and management of materials critical to national security. The NDS currently contains 54 commodities stored at 10 locations within the continental United States. Under the authority of the Defense Production Act of 1950 (Public Law 81–774), the USGS advises the DLA Strategic Materials on acquisitions and disposals of NDS mineral materials. Starting in fiscal year 2026, data from the Annual Materials Plan for acquisitions and disposals were not available.

Foreign Trade

In 2025, additional tariffs were implemented under section 232 of the Trade Expansion Act (section 232, 19 U.S.C. 1862, as amended) on U.S. imports of steel and aluminum. Executive Order 14272, signed in April, directed the U.S. Department of Commerce (DOC) to initiate a section 232 investigation into critical minerals and finished products (for example, semiconductors, electric vehicles, batteries, and smartphones) that use these minerals. This investigation was ongoing at the end of 2025. In July, tariffs were imposed on copper products following a June section 232 determination by the DOC.

Several countries responded against U.S. trade policy actions. Table 4 summarizes some of the major export controls implemented by various Governments over the past several years. Our analysis includes only nontariff barriers to highlight trade policy actions that could affect the flow of physical quantities of mineral commodities. The following is a brief synopsis of some of the more notable trade policy actions over the past year.

In February, the Government of China implemented export controls and licensing requirements on bismuth, indium, molybdenum, tellurium, and tungsten. In April, China applied export controls on dysprosium, gadolinium, lutetium, samarium, scandium, terbium, and yttrium. In early October, China issued export controls on erbium, europium, holmium, thulium, and ytterbium. However, in late October following an agreement with the United States Government, China suspended the October controls for 1 year but left the April controls in effect.

In February, Congo (Kinshasa) implemented a 4-month export ban for cobalt, citing low prices. The ban was extended for another 3 months in June to allow time for the Government to establish an export quota system. In October, the Government replaced the ban with an export quota system. For the remainder of 2025, the quota was 18,125 tons of contained cobalt. In 2026 and 2027, the annual quota was expected to be 96,600 tons per year, of which 87,000 tons would be issued. The remaining 9,600 tons would be held in a Government stockpile.

In June, the Government of Gabon announced that it would implement a ban on exports of manganese ore starting in 2029 as part of a national strategy to add value to the mineral rather than rely on exports of raw ore. Gabon is the world’s second leading producer of manganese ore behind South Africa. In 2025, the United States was estimated to have a net import reliance of 100% for manganese ore, and 64% of its imports between 2021 and 2024 were sourced from Gabon.

In November, the Government of Malaysia reaffirmed the country’s mineral sovereignty regarding rare earth ore, particularly the country’s ion absorption clay deposits, when signing agreements with international partners. The policy underscores Malaysia’s focus on downstream technology development rather than the export of raw ore.

In an ongoing effort to reduce reliance on China and to bolster the domestic supply chains for critical minerals, the United States signed or initiated several trade framework agreements in 2025 (table 5).

Table 1.—U.S. Mineral Industry Trends

	2021	2022	2023	2024	2025[e]
Total mine production (million dollars):					
Metals	36,800	35,200	33,000	33,600	38,100
Industrial minerals	58,800	67,700	72,100	72,200	73,700
Coal	21,000	32,400	31,200	26,900	27,600
Employment (thousands of workers):					
Coal mining, all employees	37	41	43	41	40
Nonfuel mineral mining, all employees	138	141	145	149	150
Chemicals and allied products, all employees	868	895	895	894	900
Stone, clay, and glass products, all employees	402	415	417	416	410
Primary metal industries, all employees	348	365	372	369	360
Average weekly earnings of workers (dollars):					
Coal mining, all employees	1,805	1,979	2,107	2,162	2,200
Chemicals and allied products, all employees	2,031	2,111	2,168	2,273	2,300
Stone, clay, and glass products, all employees	1,276	1,337	1,398	1,452	1,500
Primary metal industries, all employees	1,505	1,609	1,657	1,716	1,800

[e]Estimated.

Sources: U.S. Geological Survey, U.S. Department of Energy, and U.S. Department of Labor.

Table 2.—U.S. Mineral-Related Economic Trends

	2021	2022	2023	2024	2025[e]
Gross domestic product (billion dollars)	23,726	26,055	27,812	29,298	30,500
Industrial production (2017=100):					
Total index:	99	101	101	100	100
Manufacturing:	98	98	97	96	98
Nonmetallic mineral products	101	103	101	95	97
Primary metals:	96	100	100	97	99
Iron and steel	102	107	108	104	110
Aluminum	97	105	98	98	98
Nonferrous metals (except aluminum)	95	97	98	94	93
Chemicals	100	96	98	100	103
Mining:	106	115	120	119	120
Coal	75	77	76	67	70
Oil and gas extraction	123	131	141	144	150
Metals	92	87	85	81	80
Nonmetallic minerals	103	107	107	102	100
Capacity utilization (percent):					
Total industry:	77	78	77	76	76
Mining:	76	84	85	83	85
Metals	65	61	60	57	57
Nonmetallic minerals	85	87	87	83	85
Housing starts (thousands)	1,603	1,552	1,421	1,371	1,380
Light vehicle sales (thousands)	14,947	13,754	15,503	15,858	16,200
Highway construction, value, put in place (billion dollars)	103	115	139	145	140

[e]Estimated.

Sources: U.S. Department of Commerce and Federal Reserve Board.

Figure 2.—2025 U.S. Net Import Reliance[1]

Commodity	Net import reliance as a percentage of apparent consumption in 2025	Leading import sources (2021–24)[2]
ARSENIC, all forms	100	China,[3] Malaysia, Morocco
ASBESTOS	100	Brazil
CESIUM	100	China, Germany
FLUORSPAR	100	Mexico, Vietnam, China,[3] South Africa
GALLIUM	100	Canada, Japan, China, Germany
GRAPHITE (NATURAL)	100	China,[3] Canada, Mozambique, Mexico
INDIUM	100	Republic of Korea, Japan, China,[3] Canada
MANGANESE	100	Gabon, South Africa, Malaysia, Australia
MICA (NATURAL), sheet	100	China, Vietnam, Brazil, India
NIOBIUM (COLUMBIUM)	100	Brazil, Canada
RUBIDIUM	100	China, Germany, Russia
SCANDIUM	100	Japan, China
STRONTIUM	100	Mexico, Germany, China
TANTALUM	100	China,[3] Australia, Germany, Indonesia
TITANIUM, sponge metal	100	Japan, Saudi Arabia, Kazakhstan
YTTRIUM	100	China,[3] Germany, Austria, Republic of Korea
GEMSTONES	99	India, Israel, Belgium, South Africa
XENON	98	Not available
ABRASIVES, fused aluminum oxide	>95	China,[3] Canada, Brazil, Austria
NEPHELINE SYENITE	>95	Canada
KRYPTON	93	Not available
BISMUTH	92	China,[3] Republic of Korea, Germany
POTASH	92	Canada, Russia, Israel
ANTIMONY, metal and oxide	91	China, Belgium, Thailand, India
PLATINUM	89	South Africa, Belgium, Germany, Italy
TITANIUM MINERAL CONCENTRATES	88	South Africa, Canada, Madagascar, Mozambique
STONE (DIMENSION)	85	Brazil, Italy, China,[3] India
IRON OXIDE PIGMENTS, natural and synthetic	84	China,[3] Germany, Brazil, Canada
DIAMOND (INDUSTRIAL), stones	81	India, South Africa, Russia, Botswana
PEAT	80	Canada
CHROMIUM, all forms	79	South Africa, Kazakhstan, Finland, Canada
COBALT	79	Norway, Finland, Canada, Japan
SILVER	77	Mexico, Canada, Chile, Turkey
TIN, refined	77	Peru, Bolivia, Indonesia, Brazil
RHENIUM	75	Chile, Canada, Germany, Poland
BARITE	>75	India, China,[3] Morocco, Mexico
BAUXITE	>75	Jamaica, Turkey, Guyana, Australia
MAGNESIUM METAL	>75	Israel, Canada, Turkey, Czechia
ABRASIVES, silicon carbide	74	China,[3] Brazil
ZINC, refined	73	Canada, Mexico, Peru, Republic of Korea
ALUMINA	71	Brazil, Jamaica, Australia, Canada
GARNET (INDUSTRIAL)	71	South Africa, Australia, China,[3] India
RARE EARTHS,[4] compounds and metals	67	China,[3] Malaysia, Estonia, Japan
ALUMINUM	60	Canada, United Arab Emirates, Bahrain, China[3]
MAGNESIUM COMPOUNDS	59	China,[3] Brazil, Canada, Israel
COPPER, refined	57	Chile, Canada, Peru, Mexico
PALLADIUM	57	South Africa, Russia, Belgium, Canada
NEON	52	Not available
GERMANIUM	>50	Belgium, China, Canada, Germany
LITHIUM	>50	Chile, Argentina
QUARTZ, industrial cultured crystal	>50	China,[3] Denmark, Japan
SELENIUM	>50	Philippines, Mexico, Chile, Poland
SILICON, metal and ferrosilicon	>50	Brazil, Canada, Russia, Malaysia
TUNGSTEN	>50	China,[3] Germany, Bolivia, Vietnam
IODINE	<50	Chile, Japan
NICKEL	41	Canada, Norway, Australia, Brazil
VANADIUM	41	Canada, Brazil, South Africa, Austria
DIAMOND (INDUSTRIAL), bort, grit, and dust and powder	35	China,[3] Republic of Korea, Ireland
MICA (NATURAL), scrap and flake	34	China, Canada, India, Finland
LEAD, refined	33	Canada, Republic of Korea, Mexico, Australia
SALT	31	Mexico, Chile, Canada, Egypt
TELLURIUM	>25	Canada, Philippines, Japan, Germany
VERMICULITE	25	South Africa, Brazil, Zimbabwe, Uganda
BROMINE	<25	Israel, Jordan, China[3]
CADMIUM	<25	China,[3] Germany, Australia, Peru
ZIRCONIUM, ores and concentrates	<25	South Africa, Australia, Senegal
PERLITE	23	Greece, China
TALC	22	Pakistan, Canada, China
CEMENT	21	Turkey, Canada, Vietnam, Greece

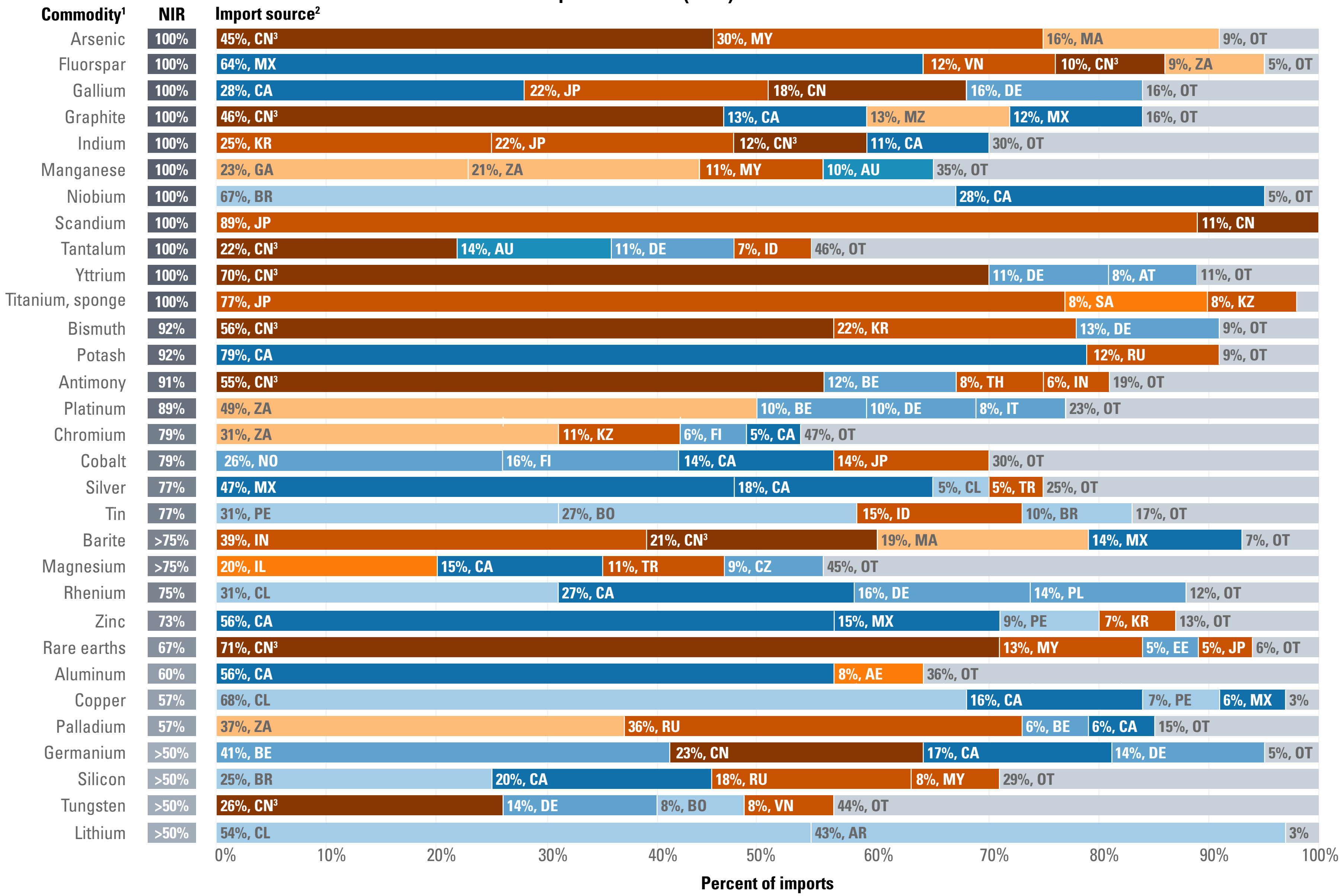
[1]Not all mineral commodities covered in this publication are listed here. Those not shown include mineral commodities for which the United States is a net exporter (abrasives, metallic; argon; beryllium; boron; clays; diatomite; helium; iron and steel scrap; iron ore; kyanite; molybdenum; rare earths, mineral concentrates; sand and gravel, industrial; soda ash; titanium dioxide pigment; wollastonite; zeolites; and zinc, ores and concentrates) or less than 20% net import reliant (feldspar; gypsum; iron and steel; iron and steel slag; lime; nitrogen, fixed—ammonia; phosphate rock; pumice; sand and gravel, construction; stone, crushed; and sulfur). For some mineral commodities (gold; hafnium; mercury; quartz, high-purity; thallium; and thorium), not enough information was available to calculate the exact percentage of import reliance.

[2]Listed in descending order of import share.

[3]Includes Hong Kong.

[4]Includes lanthanides cerium, dysprosium, erbium, europium, gadolinium, holmium, lanthanum, lutetium, neodymium, praseodymium, samarium, terbium, thulium, and ytterbium.

Figure 3A.—Import Sources (2021–24) of Critical Minerals for Which the United States Was Greater Than 50% Net Import Reliant (NIR) in 2025

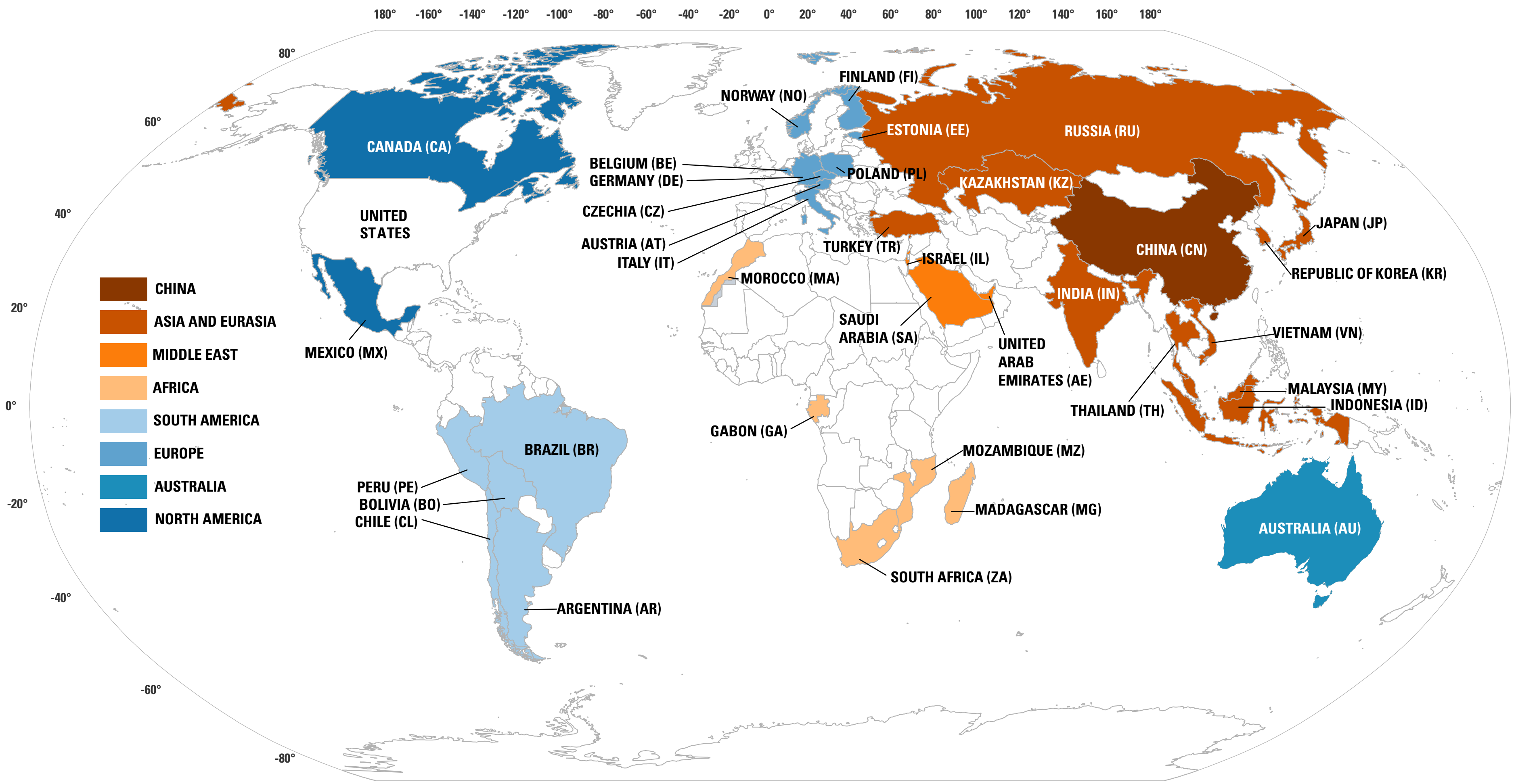


[1]Copper is limited to refined copper. Graphite is limited to natural graphite. Magnesium is limited to metal. Rare earths are limited to compounds and metals. Silicon includes ferrosilicon and silicon metal. Tin is limited to refined tin. Zinc is limited to refined zinc. Does not consider metallurgical coal or uranium; the U.S. Geological Survey does not collect data for these mineral commodities.

[2]AE, United Arab Emirates; AR, Argentina; AT, Austria; AU, Australia; BE, Belgium; BO, Bolivia; BR, Brazil; CA, Canada; CL, Chile; CN, China; CZ, Czechia; DE, Germany; EE, Estonia; FI, Finland; GA, Gabon; ID, Indonesia; IL, Israel; IN, India; IT, Italy; JP, Japan; KR, Republic of Korea; KZ, Kazakhstan; MA, Morocco; MG, Madagascar; MX, Mexico; MY, Malaysia; MZ, Mozambique; NO, Norway; OT, Other; PE, Peru; PL, Poland; RU, Russia; SA, Saudi Arabia; TH, Thailand; TR, Turkey; VN, Vietnam; ZA, South Africa.

[3]Includes Hong Kong.

Figure 3*B*.—Import Sources* (2021–24) of Critical Minerals for Which the United States Was Greater Than 50% Net Import Reliant in 2025



Source: U.S. Geological Survey

*Countries as listed in figure 3*A*.

Table 3.—Value of Nonfuel Mineral Production in the United States and Principal Nonfuel Mineral Commodities Produced in 2025[p, 1, 2]

State	Value (millions)	Rank[3]	Percent of U.S. total[4]	Principal nonfuel mineral commodities[5]
Alabama	$2,480	15	2.22	Cement, lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Alaska	6,410	4	5.73	Gold, lead, sand and gravel (construction), silver, zinc.
Arizona	10,400	2	9.28	Cement, copper, molybdenum mineral concentrates, sand and gravel (construction), stone (crushed).
Arkansas	1,050	30	0.94	Bromine compounds, cement, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
California[6]	5,860	5	5.24	Boron minerals, cement, gold, sand and gravel (construction), stone (crushed).
Colorado	2,330	18	2.09	Cement, gold, molybdenum mineral concentrates, sand and gravel (construction), stone (crushed).
Connecticut	253	43	0.23	Sand and gravel (construction), stone (crushed), stone (dimension).
Delaware[7]	19	50	0.02	Magnesium compounds, sand and gravel (construction), stone (crushed).
Florida[6, 7]	3,020	6	2.7	Cement, phosphate rock (marketable), sand and gravel (construction), stone (crushed).
Georgia[6]	2,750	12	2.46	Cement, clay (attapulgite, common clay, kaolin, montmorillonite), sand and gravel (construction), stone (crushed).
Hawaii	184	45	0.16	Sand and gravel (construction), stone (crushed).
Idaho[7]	668	32	0.6	Lead, phosphate rock (marketable), sand and gravel (construction), silver, zinc.
Illinois	1,240	27	1.11	Cement (portland), magnesium compounds, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Indiana	1,680	23	1.5	Cement, lime, sand and gravel (construction), stone (crushed), stone (dimension).
Iowa	838	35	0.75	Cement (portland), gypsum, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Kansas[7]	834	26	0.75	Cement, helium (grade-a), salt, sand and gravel (construction), stone (crushed).
Kentucky[7]	863	28	0.77	Cement (portland), clay [common clay and (or) shale], lime, sand and gravel (construction), stone (crushed).
Louisiana[7]	777	34	0.69	Lime, salt, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Maine	220	44	0.2	Cement, peat, sand and gravel (construction), stone (crushed), stone (dimension).
Maryland[7]	527	31	0.47	Cement, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Massachusetts[7]	392	40	0.35	Lime, sand and gravel (construction), stone (crushed), stone (dimension).
Michigan	2,870	10	2.57	Cement, iron ore, salt, sand and gravel (construction), stone (crushed).
Minnesota[7]	3,160	9	2.83	Iron ore, lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Mississippi[7]	223	42	0.2	Clay (ball clay, bentonite, common clay, montmorillonite), sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Missouri	3,420	8	3.06	Cement, lead, lime, sand and gravel (industrial), stone (crushed).
Montana	1,150	29	1.03	Cement, copper, molybdenum mineral concentrates, palladium metal, sand and gravel (construction).

See footnotes at end of table.

Table 3.—Value of Nonfuel Mineral Production in the United States and Principal Nonfuel Mineral Commodities Produced in 2025[p, 1, 2]—Continued

State	Value (millions)	Rank[3]	Percent of U.S. total[4]	Principal nonfuel mineral commodities[5]
Nebraska[7]	$142	41	0.13	Cement (portland), lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Nevada	12,600	1	11.26	Copper, diatomite, gold, sand and gravel (construction), silver.
New Hampshire[7]	172	46	0.15	Sand and gravel (construction), sand and gravel (industrial), stone (crushed), stone (dimension).
New Jersey[7]	536	38	0.48	Peat, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
New Mexico	1,630	24	1.46	Cement, copper, potash, sand and gravel (construction), stone (crushed).
New York[7]	1,890	19	1.7	Cement, salt, sand and gravel (construction), stone (crushed), zinc.
North Carolina	2,680	13	2.4	Phosphate rock (marketable), quartz (high-purity), sand and gravel (construction), sand and gravel (industrial), stone (crushed).
North Dakota[7]	90	48	0.08	Clay [common clay and (or) shale], lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Ohio	2,360	17	2.11	Cement, lime, salt, sand and gravel (construction), stone (crushed).
Oklahoma	1,370	25	1.22	Cement, iodine (crude), sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Oregon	724	36	0.65	Cement (portland), diatomite, pumice, sand and gravel (construction), stone (crushed).
Pennsylvania[7]	2,200	14	1.96	Cement, lime, sand and gravel (construction), stone (crushed).
Rhode Island[7]	100	49	0.09	Sand and gravel (construction), sand and gravel (industrial), stone (crushed).
South Carolina	2,110	20	1.89	Cement, gold, sand and gravel (construction), stone (crushed).
South Dakota	712	37	0.64	Cement (portland), gold, lime, sand and gravel (construction), stone (crushed).
Tennessee	2,400	16	2.15	Cement, sand and gravel (construction), sand and gravel (industrial), stone (crushed), zinc.
Texas	10,200	3	9.12	Cement, lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Utah	3,930	7	3.51	Cement (portland), copper, gold, salt, sand and gravel (construction).
Vermont[7]	165	47	0.15	Sand and gravel (construction), stone (crushed), stone (dimension), talc (crude).
Virginia	1,950	21	1.74	Cement, kyanite, lime, sand and gravel (construction), stone (crushed).
Washington	890	33	0.8	Cement, diatomite, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
West Virginia[7]	260	39	0.23	Cement, lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed).
Wisconsin[7]	1,690	22	1.51	Lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed), stone (dimension).
Wyoming[7]	579	11	0.52	Cement, clay (bentonite and common clay), helium (grade-a), sand and gravel (construction), soda ash.
Undistributed	6,870	XX	6.14	XX.
Total	112,000	XX	100.00	

[p]Preliminary. XX Not applicable.

[1]Includes data available through December 17, 2025.

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Rank based on total, unadjusted State values.

[4]"Percent of U.S. total" calculated to two decimal places.

[5]As many as five leading mineral commodities listed in alphabetical order.

[6]California, Florida, and Georgia also produced significant quantities of titanium mineral concentrates and zirconium mineral concentrates. Breakdown by State is not available to avoid disclosure of company proprietary data.

[7]Partial total; excludes values that must be withheld to avoid disclosing company proprietary data, which are included with "Undistributed."

Table 4.—Export Control on Mineral Commodities, by Country

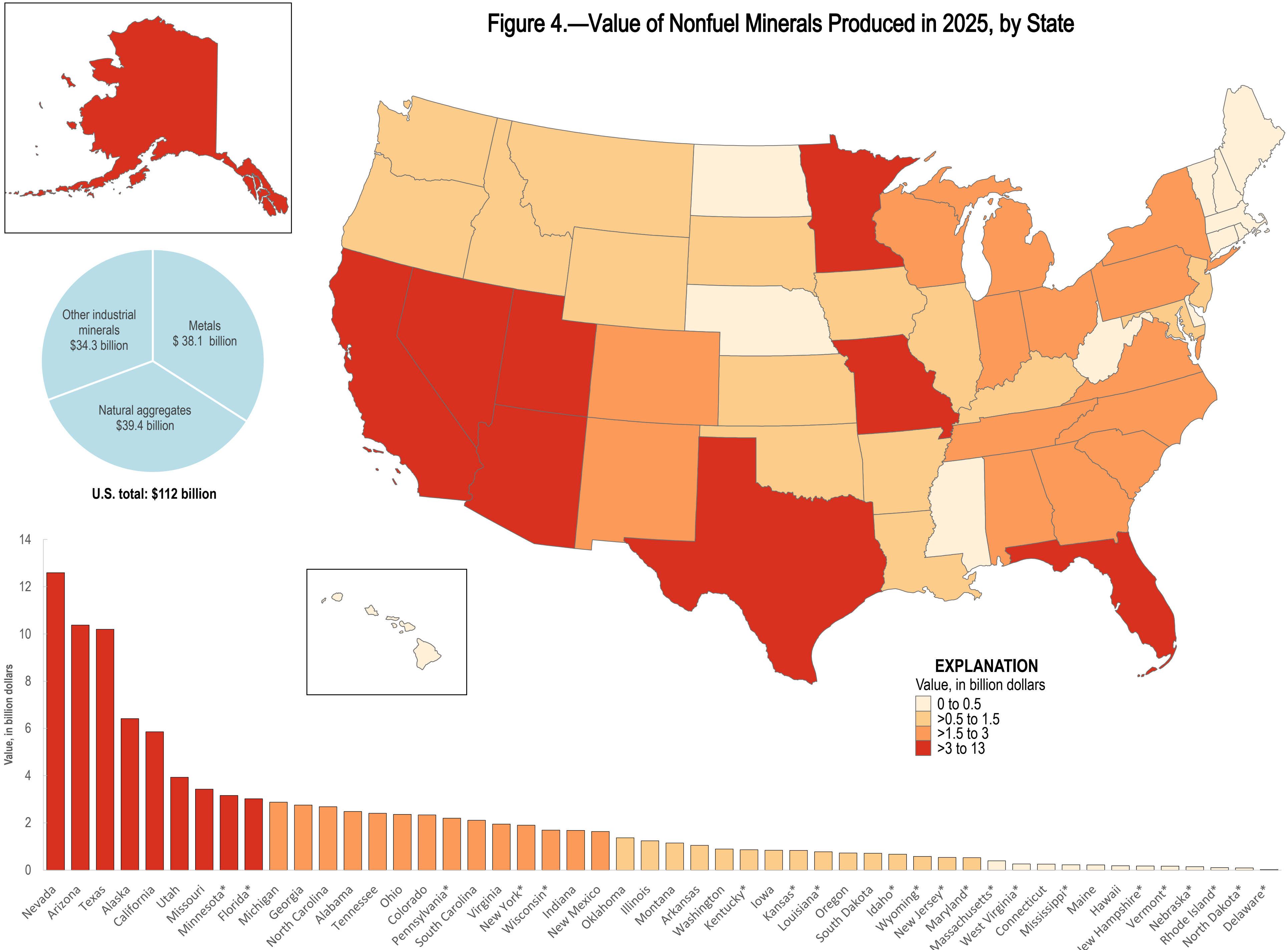
Type of export control and country	Commodity (latest year of implementation[1])
Export ban:	
Angola	Quartz and gypsum (2024).
Botswana	Raw diamond (2025).
Gabon	Manganese ore (2029, planned).
Indonesia	Bauxite (2023), copper concentrates (2023), and nickel ore (2020).
Laos	Raw minerals, including copper, gold, iron, nickel, potassium, silver, and zinc (2024).
Malaysia	Raw rare earths (2025).
Namibia	Ores and concentrates of cobalt, graphite, lithium, manganese, and rare earths (2023).
Russia	Steel waste and scrap, tungsten scrap, and enriched uranium (2022).
Tajikistan	Metal waste and scrap (2020).
Tanzania	Ore concentrates of copper, gold, nickel, and silver (2017).
Thailand	Natural sand (2023).
Venezuela	Bauxite, cassiterite, columbite-tantalite, copper, gold, rhodium, silver, and thorium (2024).
Vietnam	Raw materials of apatite, chromite, iron, lead-zinc, manganese, rare earths, and unprocessed titanium (2012).
Zimbabwe	Lithium ore (2022).
Export licensing requirement for materials and technologies:	
China	Antimony (2024), bismuth (2025), synthesized diamond (2025), gallium (2023), germanium (2023), graphite (2023), indium (2025), magnesium materials (2024), molybdenum (2025), rare earths (2025), silver (2026), tellurium (2025), tungsten (2025), and items related to lithium batteries and artificial graphite anode materials (2025).
Export quota:	
Congo (Kinshasa)	Cobalt (2025).
Export licensing requirement:	
Morocco	Copper (refined and alloys) and aluminum ingot (2025).
South Africa	Chromium ore export controls require permit (2025).
Temporary export ban:	
Armenia	Metal waste and scrap (2025).
Kyrgyzstan	Ferrous ingot and ferrous metal waste and scrap (2023) and catalysts and waste containing precious metals (2025).

[1]Excludes past export controls that have been lifted. Includes data available through November 21, 2025, effective as of January 2026 or planned.

Table 5.—Recent Mineral-Related Trade Agreements, by Country

Country	Agreement	Signing date	Key focus areas
Australia	United States-Australia Framework for Securing of Supply in the Mining and Processing of Critical Minerals and Rare Earths	October 20, 2025	Joint mining, processing, refining; defense and clean energy applications.
China	Strategic Agreement on Rare Earth Export Controls	October 30, 2025	Pause on Chinese export controls in exchange for United States trade concessions.
Indonesia	Joint Statement on Framework for United States-Indonesia Agreement on Reciprocal Trade	July 22, 2025	Removal of export restrictions, including critical minerals.
Japan	Critical Minerals Agreement	March 28, 2025	Electric vehicle battery minerals (lithium, cobalt, nickel, graphite, manganese).
Japan	United States-Japan Framework for Securing the Supply of Critical Minerals and Rare Earths through Mining and Processing	October 27, 2025	Mining, processing, supply chain diversification.
Japan and Republic of Korea	Trilateral Cooperation	August 2023	Cooperation on critical minerals.
Malaysia	Memorandum of Understanding Between the Government of the United States and the Government of Malaysia Concerning Cooperation to Diversify Global Critical Mineral Supply Chains and Promote Investments	October 26, 2025	Supply chain diversification, investment promotion.
Philippines	Reciprocal Trade Framework	February 2025	Cooperation on critical minerals with a focus on nickel.
Thailand	Memorandum of Understanding Between the Government of the United States of America and the Government of the Kingdom of Thailand Concerning Cooperation to Diversify Global Critical Minerals Supply Chains and Promote Investment	October 26, 2025	Supply chain diversification, investment promotion.

Figure 4.—Value of Nonfuel Minerals Produced in 2025, by State



*Partial total; excludes values that must be withheld to avoid disclosing company proprietary data, which are included with "Undistributed" in table 3.

Figure 5.—Value of Metals and Metallic Minerals Produced in 2025, by Region

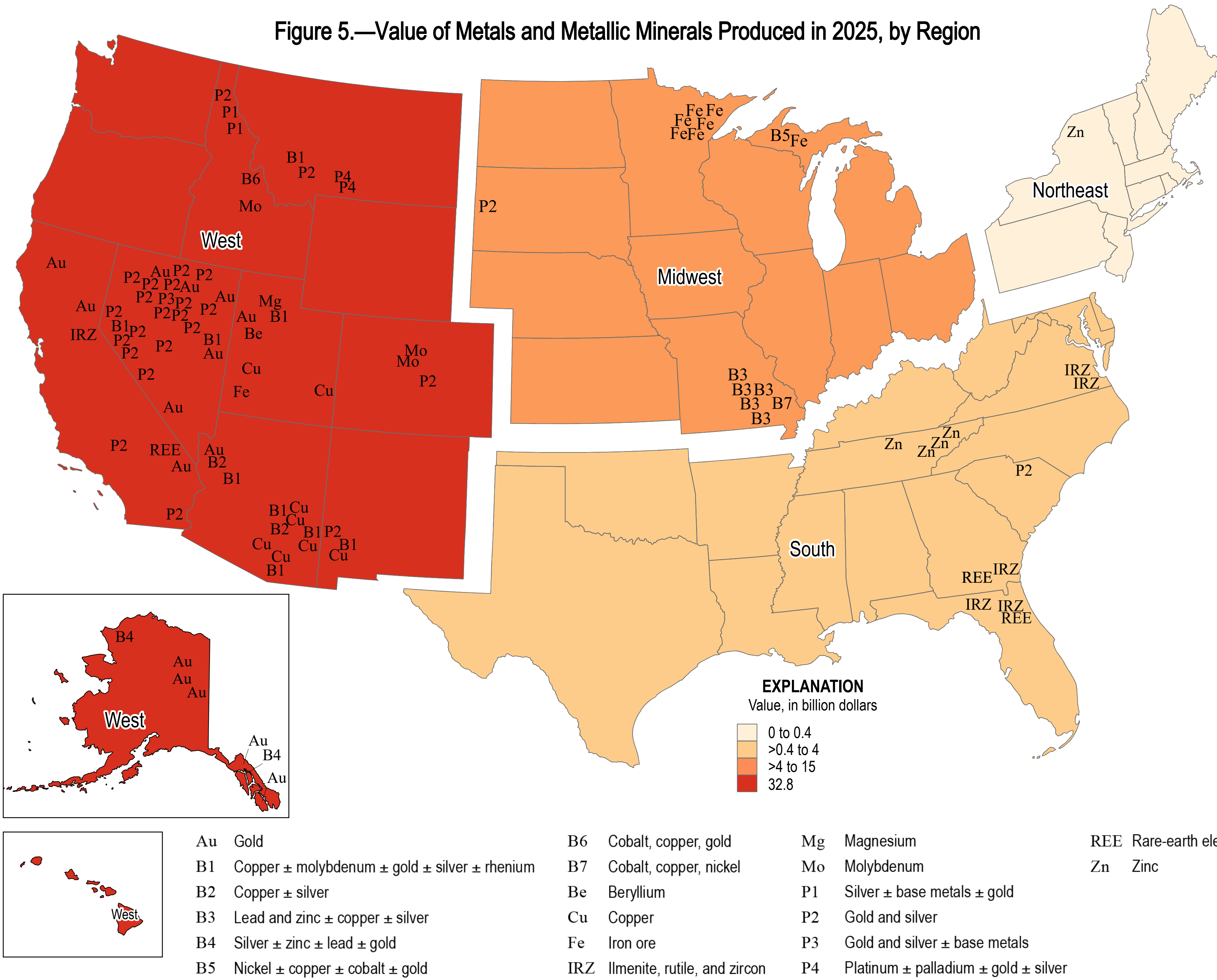
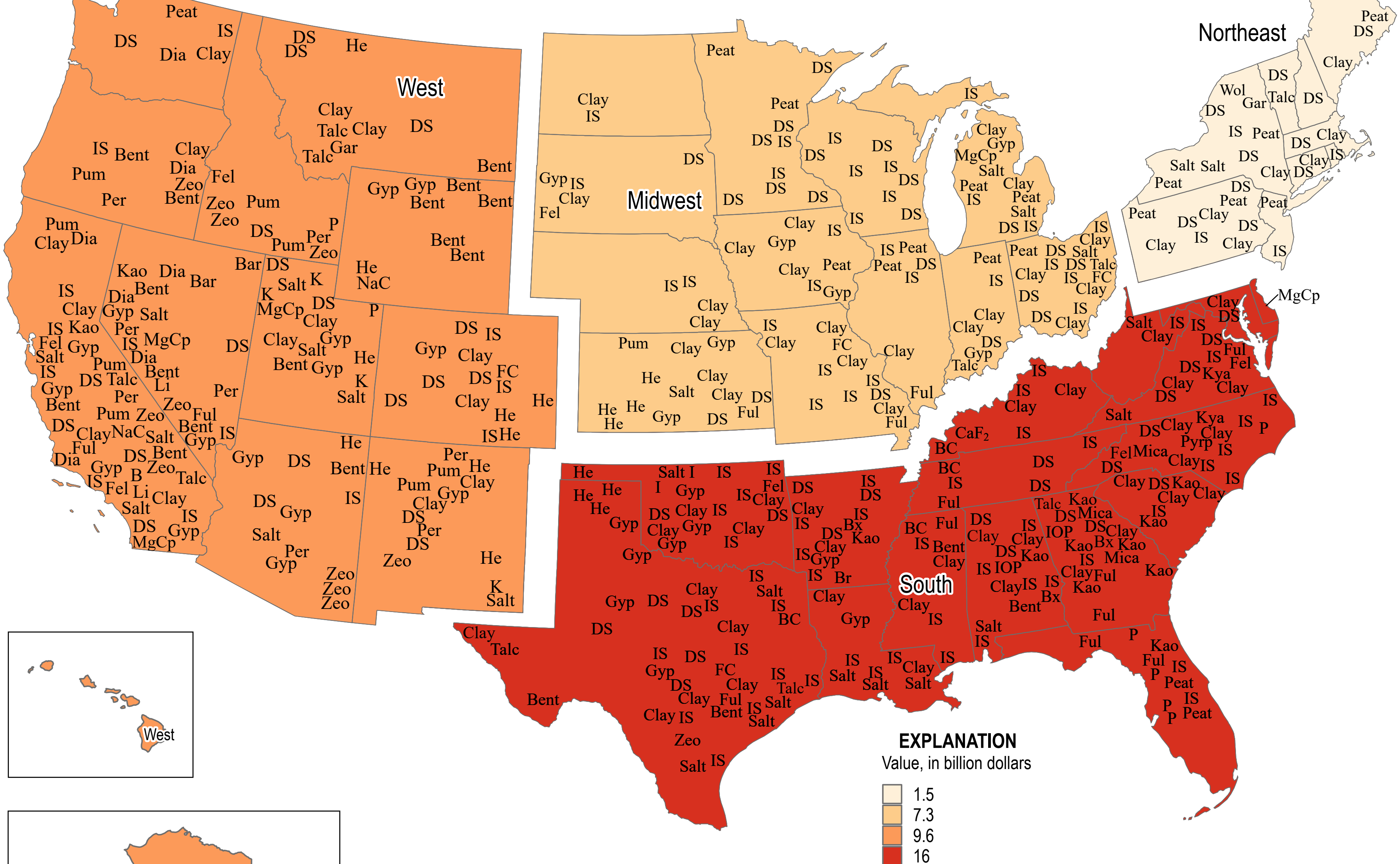
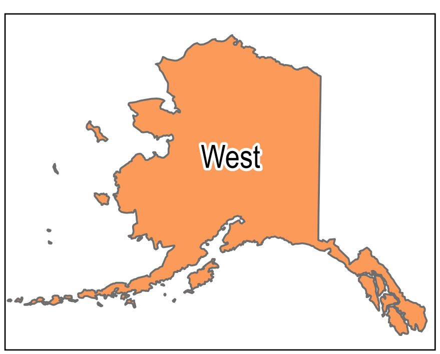


Figure 6.—Value of Other Industrial Minerals Produced in 2025, by Region





B	Borates	Clay	Common clay	Gyp	Gypsum	Kya	Kyanite	Per	Perlite
Bar	Barite	Dia	Diatomite	He	Helium	Li	Lithium	Pum	Pumice
BC	Ball clay	DS	Dimension stone	I	Iodine	MgCp	Magnesium compounds	Pyrp	Pyrophyllite
Bent	Bentonite	FC	Fire clay	IOP	Iron oxide pigments	Mica	Mica	Salt	Salt
Br	Bromine	Fel	Feldspar	IS	Industrial sand	NaC	Soda ash	Talc	Talc
Bx	Bauxite	Ful	Fuller's earth	K	Potash	P	Phosphate rock	Wol	Wollastonite
CaF_2	Fluorspar	Gar	Garnet	Kao	Kaolin	Peat	Peat	Zeo	Zeolites

Figure 7.—Value of Crushed Stone Produced in 2025, by State

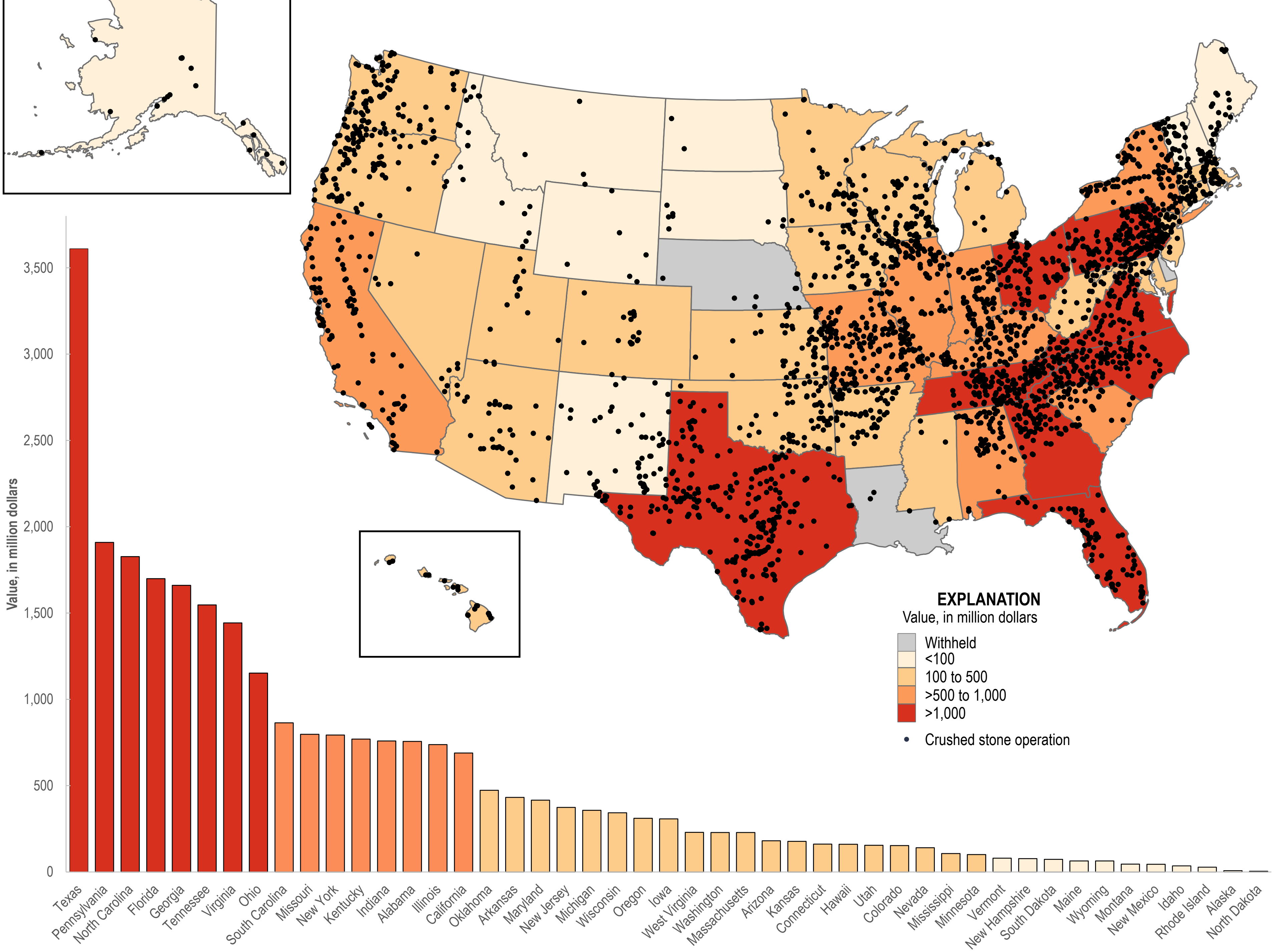


Figure 8.—Value of Construction Sand and Gravel Produced in 2025, by State

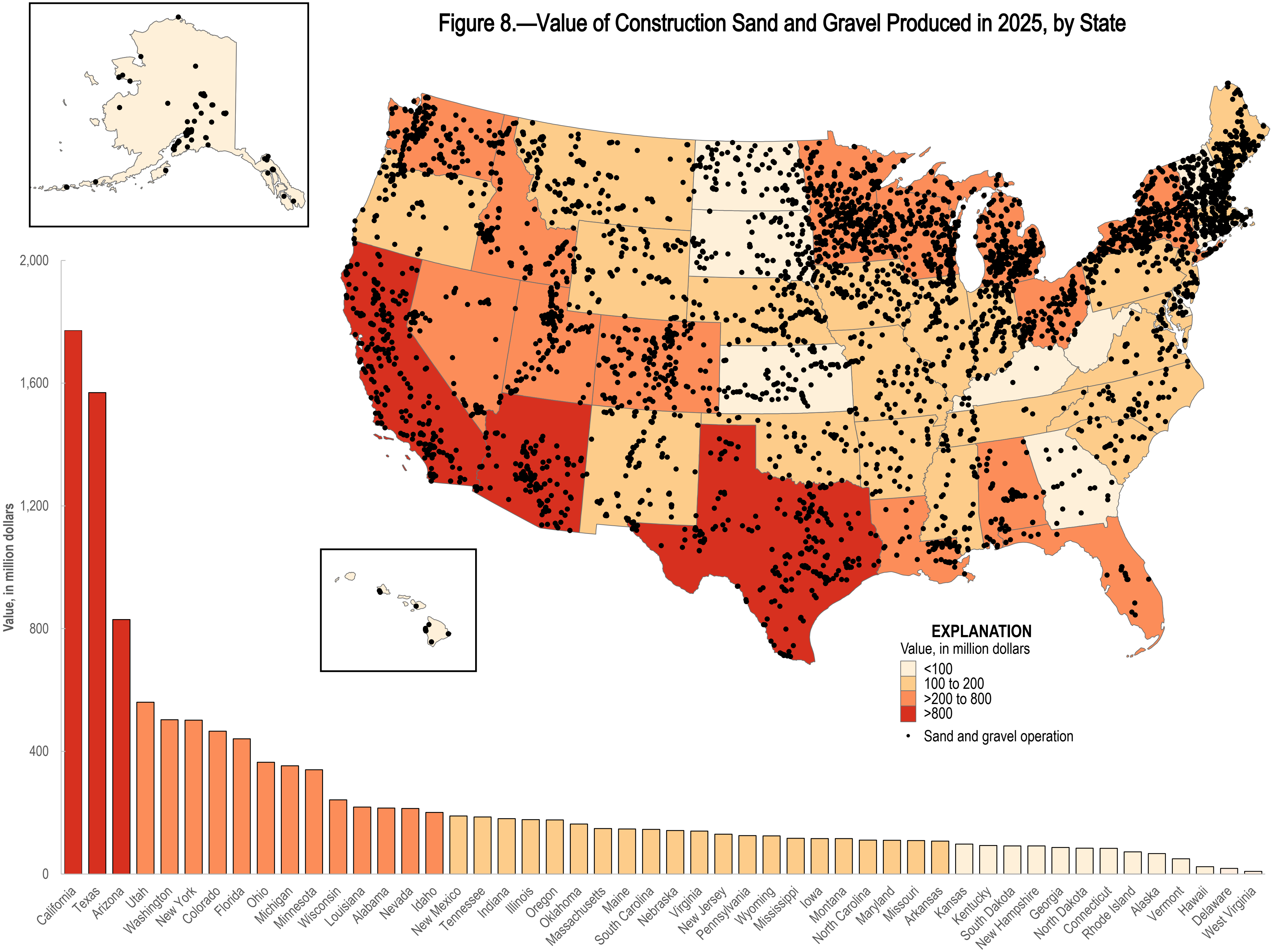


Table 6.—The U.S. Final 2025 Critical Minerals List[1]

Critical mineral	Applications
Aluminum	Metallurgy and many sectors of the economy.
Antimony	Flame retardants and lead-acid batteries.
Arsenic	Pesticides and semiconductors.
Barite	Oil and gas drilling and medical imaging.
Beryllium	Aerospace and defense.
Bismuth	Medical, metallurgy, and atomic research.
Boron	Nuclear energy and hardening of steel and glass.
Cerium[2]	Catalytic converters, ceramics, glass, metallurgy, and polishing compounds.
Cesium	Atomic clocks for global positioning systems and research and development.
Chromium	Stainless steel and metallurgy.
Cobalt	Batteries and metallurgy.
Copper	Cables and wiring.
Dysprosium[2]	Data storage devices, lasers, and permanent magnets.
Erbium[2]	Fiber optics, glass colorant, lasers, and optical amplifiers.
Europium[2]	Nuclear control rods and phosphors.
Fluorspar	Cement, industrial chemicals, and metallurgy.
Gadolinium[2]	Medical imaging, metallurgy, and permanent magnets.
Gallium	Integrated circuits and optical devices.
Germanium	Fiber optics, night vision devices, and semiconductors.
Graphite	Batteries, fuel cells, and lubricants.
Hafnium	Ceramics, nuclear control rods, semiconductors, and super alloys for aerospace.
Holmium[2]	Lasers, nuclear control rods, and permanent magnets.
Indium	Flat-panel displays and touchscreens.
Iridium[3]	Anode coatings for electrochemical processes and chemical catalysts.
Lanthanum[2]	Batteries, catalysts, ceramics, glass, and metallurgy.
Lead	Ammunition, batteries, ceramics, and glass production.
Lithium	Batteries.
Lutetium[2]	Cancer therapies, electronics, and medical imaging.
Magnesium	Metal alloys for aerospace, automotive, and electronics industries.
Manganese	Batteries and metallurgy.
Metallurgical coal[4]	Steel production.
Neodymium[2]	Catalysts, lasers, and permanent magnets.
Nickel	Batteries and metallurgy.
Niobium	Steels and superalloys.
Palladium[3]	Catalytic converters, electronics, and catalysts.
Phosphate rock	Fertilizers.
Platinum[3]	Catalytic converters, aerospace alloys, chemical refining, and petroleum processing.
Potash	Fertilizers.
Praseodymium[2]	Aerospace alloys, batteries, ceramics, colorants, and permanent magnets.
Rhenium	High-performance jet engines and gas turbines.
Rhodium[3]	Catalysts including catalytic converters and electrical components.
Rubidium	Atomic clocks for global positioning systems, data network syncing, and research and development.
Ruthenium[3]	Catalysts, electronic components, and computer chips.
Samarium[2]	Cancer treatments, nuclear reactor components, and permanent magnets.
Silicon	Metallurgy and silicon wafers fundamental to semiconductors.
Silver	Batteries, electrical circuits, anti-bacterial medical instruments, and solar cells.
Scandium	Ceramics, fuel cells, and metallurgy.
Tantalum	Capacitors and metallurgy.
Tellurium	Metallurgy, solar cells, and thermoelectric devices.
Terbium[2]	Fiber optics, lasers, permanent magnets, and solid state devices.
Thulium[2]	Lasers, metallurgy, and X-ray devices.
Tin	Metallurgy.
Titanium	Metallurgy and pigments.
Tungsten	Metallurgy.
Uranium[4]	Nuclear fuel and medical applications.
Vanadium	Batteries, catalysts, and metallurgy.
Ytterbium[2]	Catalysts, lasers, metallurgy, and scintillators.
Yttrium	Catalysts, ceramics, lasers, metallurgy, and phosphors.
Zinc	Protective coatings for iron and steel.
Zirconium	Ceramics heat shields in aerospace engine components and nuclear reactors.

[1]The Final 2025 List of Critical Minerals published November 7, 2025, by the U.S. Geological Survey (90 FR 50494).
[2]Included in the Rare Earths or Rare Earths (Heavy) chapters.
[3]Included in the Platinum-Group Metals chapter.
[4]Included in the Final 2025 List of Critical Minerals but does not have a chapter in the Mineral Commodity Summaries 2026. The U.S. Geological Survey does not collect data on metallurgical coal or uranium.

U.S. CRITICAL MINERALS UPDATE

The United States List of Critical Minerals

On November 7, 2025, pursuant to section 7002 of the Energy Act of 2020 (Public Law 116–260) and using the definition of "critical mineral" and the criteria specified therein, the U.S. Geological Survey (USGS) published the "Final 2025 List of Critical Minerals" in the Federal Register (90 FR 50494) and the accompanying methodology in USGS Open-File Report 2025–1047 "Methodology and technical input for the 2025 U.S. List of Critical Minerals—Assessing the potential effects of mineral commodity supply chain disruptions on the U.S. economy." The list of critical minerals is to be updated at least every 3 years and revised as necessary consistent with available data.

The Final 2025 List of Critical Minerals, which revised the U.S. list of critical minerals published in 2022 (87 FR 10381), included 60 mineral commodities instead of 50 mineral commodities or mineral groups included in the 2022 list (table 6). The changes in the 2025 draft list of critical minerals from the 2022 list of critical minerals were the recommended addition of copper, lead, potash, rhenium, silicon, and silver and the recommended removal of arsenic and tellurium. The 2025 final list differs from the draft list by reintroducing arsenic and tellurium and adding boron, metallurgical coal, phosphate rock, and uranium, consistent with the Secretary of the Interior's authorities as specified in section 7002 of the Energy Act of 2020 (Public Law 116–260).

In addition, Executive Order 14154, "Unleashing American Energy" (January 20, 2025), directed the Secretary in section 9(c) to "instruct the Director of the U.S. Geological Survey to consider updating the Survey's List of Critical Minerals, including for the potential of including uranium."

Additionally, Executive Order 14261, "Reinvigorating America's Beautiful Clean Coal Industry and Amending Executive Order 14241" (April 8, 2025), directed the Secretary in section 9(b) to "determine whether metallurgical coal used in the production of steel meets the criteria to be designated as a 'critical mineral' under the Act and, if so, * * * take steps to place coal on the Department of Interior Critical Minerals List."

Background

A series of actions by the Government in recent years addressed domestic supply chain vulnerabilities for critical minerals, beginning with Executive Order 13817, "A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals," which was issued on December 26, 2017, and initiated a whole-of-Government call to action to identify critical minerals and develop a strategy to address U.S. supply-chain vulnerabilities. Subsequently, there have been additional actions including the following:

1. The USGS published the 2018 List of Critical Minerals;
2. The U.S. Department of Commerce (DOC) with interagency input published the "2019 Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals";
3. Several Presidential determinations directed the use of Defense Production Act (DPA), Title III, authorities to strengthen the U.S. industrial base for rare-earth elements;
4. Executive Order 13953 was issued "Addressing the Threat to the Domestic Supply Chain Reliance on Critical Minerals from Foreign Adversaries and Supporting the Domestic Mining and Processing Industries"; and
5. The Energy Act of 2020 was passed by Congress and signed into law.

Additional actions in 2025 included the following:

1. In January, Executive Order 14154, "Unleashing American Energy," called for, among other provisions, the United States to become the leading producer of nonfuel minerals, including rare earths.
2. In February, Executive Order 14213, "Establishing the National Energy Dominance Council," established a council to advise the President on, among other things, how to use his authority to make the United States more energy dominant.
3. In February, Executive Order 14220, "Addressing the Threat to National Security from Imports of Copper," directed the DOC to initiate a section 232 investigation into the effects of copper imports on national security.
4. In March, Executive Order 14241, "Immediate Measures to Increase American Mineral Production," directed heads of agencies involved in permitting of mineral production to submit a list of all mineral production projects for which a plan or permit had been submitted to such agency. In addition, the executive order directed the Secretary of the Interior to provide a list of all known Federal lands that contain mineral deposits and reserves and directed the Secretary to work with other agencies on expediting permitting of such lands.
5. In April, Executive Order 14272, "Ensuring National Security and Economic Resilience Through Section 232 Actions on Processed Critical Minerals and Derivative Products," directed the DOC to conduct section 232 investigations on critical minerals as defined in the USGS List of Critical Minerals as well as derivative products manufactured from critical minerals such as advanced optical devices, batteries, electric vehicles, microprocessors, motors, permanent magnets, radar systems, smartphones, and wind turbines and their components.
6. In April, Executive Order 14285, "Unleashing America's Offshore Critical Mineral Resources," directed the National Oceanic and Atmospheric Administration and the Bureau of Ocean Energy Management to expedite reviews and issuance of seabed mineral exploration licenses.
7. In July, Congress passed and the President signed the One Big Beautiful Bill Act (Public Law 119–21), which provides $2 billion for stockpiling of critical minerals, $5 billion for the Secretary of War to invest

in critical mineral supply chains, a $500 million credit subsidy creating as much as $100 billion in available loan funding for critical minerals production and related industries and projects, and a $1 billion credit subsidy to the U.S. Department of Energy (DOE).

8. In October, a Presidential Proclamation, “Regulatory Relief for Certain Stationary Sources to Promote American Mineral Security,” granted U.S. copper operations a 2-year exemption from the so-called “copper rule” published by the Environmental Protection Agency in May 2024 that imposed new emission-control requirements on copper smelters.
9. In December, the National Defense Authorization Act of 2026, which provides numerous authorities for critical minerals including stockpiling, geomapping, and international memoranda of agreements, was signed by the President.
10. In 2025, the U.S. Export-Import Bank (EXIM Bank) launched the Supply Chain Resiliency Initiative, which will provide financing for international projects with signed offtake agreements with U.S. companies to provide them with access to critical minerals from partner countries. Using EXIM Bank’s import authority, the financed amount would be tied to the size of the offtake contract between the foreign project and the U.S. importer.

Critical Minerals Investments and U.S. Government Critical Mineral Framework Agreements in 2025

Through a combination of stockpiling, direct equity stakes and other investments, grants and loans, the U.S. Department of War (DOW) invested approximately $1 billion in critical minerals in 2025. Notable acquisitions by the National Defense Stockpile will include antimony, cobalt, scandium, and tantalum. In 2025, the DOW took equity stakes and provided loans in the domestic production of copper, gold, lead, rare earths, silver, and zinc.

Additional DOW investments included the following:

1. On January 17, 2025, the DOW announced a $5.1 million award through the DPA, Title III, to a domestic rare earth recycling company. The company would target the recovery of dysprosium, neodymium, praseodymium, and terbium used in neodymium iron boron (NdFeB) magnets.
2. On July 10, 2025, the DOW Office of Strategic Capital (OSC) announced the disbursement of its first direct loan as part of a wider July 2025 agreement between the DOW and a domestic rare earths producer. The OSC provided a $150 million loan to add heavy rare earths separation capabilities to the company’s existing processing facility in Mountain Pass, CA.
3. On July 22, 2025, the DOW announced a $6.2 million award to domestic mining company through the DPA, Title III. The award would enable the company to deliver a prefeasibility study for a tungsten mining site located southeast of Hawthorne, NV.
4. On August 5, 2025, the DOW announced a $10 million award to a domestic company to produce niobium and scandium. The company is developing the United States’ first polymetallic deposit targeting near-term production of niobium, scandium, titanium, and other critical minerals.
5. On September 30, 2025, the DOW announced a $43.4 million award to a domestic mining company with a project in Alaska. The award would enable the company to extract, concentrate, and refine extracted stibnite to produce military-grade antimony trisulfide.
6. On November 20, 2025, the DOW announced a $29.9 million award through the DPA, Title III, to a domestic company to produce gallium and scandium.
7. On November 21, 2025, the OSC announced a joint $700 million conditional loan commitment to increase domestic neodymium iron boron (NdFeB) magnet production.
8. In December 2025, the DOW announced a partnership with a company based in the Republic of Korea on a $7.4 billion smelter project in Clarksville, TN. The smelter would initially produce lead and zinc with lesser amounts of copper but would be designed to produce antimony, bismuth, cadmium, gallium, germanium, gold, indium, palladium, silver, and tellurium as byproducts. The DOC also provided $210 million in grants under the CHIPS and Science Act.
9. In December 2025, the U.S. International Development Finance Corporation (DFC) announced a loan to an Angola-based railway. The loan would help to rehabilitate the infrastructure and increase the railway’s capacity to 4.6 million tons per year.

In 2025, the DOE awarded a domestic lithium producer a $996 million loan guarantee to develop a lithium carbonate processing facility in Nevada and a $225 million grant to develop a lithium processing facility in Arkansas. The DOE also awarded a combined $30 million in grants to various feasibility studies in the Pacific Northwest and Alaska, the Rocky Mountains, the Great Plains, and the Appalachian Mountains. Also in 2025, the DOE announced approximately $1 billion in notice of funding opportunities consisting of as much as $50 million through the Critical Minerals and Materials Accelerator Program, which promotes technology maturation that can unlock capital investments to commercialize production, a $250 million financial assistance facility to support the recovery of byproducts during mineral processing, as much as $135 million to enhance domestic supply chains for rare earths, as much as $500 million to expand domestic battery manufacturing and recycling, and $40 million to extract critical minerals from industrial wastewater.

In May, the United States finalized a deal with Ukraine on critical minerals. The deal included, among other provisions, the creation of a Reconstruction Investment Fund and the establishment of a six-member board of directors with the United States and Ukraine appointing three members each. As of September, the fund had $150 million comprised of $75 million in seed capital from the DFC that was matched by the Government of Ukraine.

In October, the DFC announced that it joined the Orion Critical Mineral Consortium with a $600 million investment that was equally matched by the Abu Dhabi Investment Authority, bringing the total fund to $1.8 billion. Orion

CMC would provide investment opportunities in projects to address supply chain gaps for critical minerals.

Critical Minerals Facilities

In July, an aluminum recycling plant in Minnesota started production from an expansion project. The project added 55,000 tons per year of billet capacity, increasing the plant's total capacity to 165,000 tons per year. In August, plans were announced to restart more than 50,000 tons per year of idled capacity at a 229,000-ton-per-year primary aluminum smelter in South Carolina, and full production was planned for mid-2026. In September, an expansion project doubled capacity at a high-purity aluminum facility in Iowa.

Multiple new facilities in the United States started producing copper in 2025. In September, the first cathode was sold from a copper mine and electrowon refinery complex in Arizona with a nameplate capacity of approximately 11,000 tons per year. Another mine in Arizona was being developed and nearing commercial operations at yearend, with production expected to start in early 2026. In the first half of 2025, copper production started at a new secondary refinery in Shelbyville, KY, with a capacity of 40,000 tons per year of copper cathode. In September, a new secondary copper smelter in Augusta, GA, also started production. The plant was initially expected to process 90,000 tons per year of copper-containing scrap such as cables and printed circuit boards to produce 35,000 tons per year of blister copper. An expansion project that would double the processing and production capacities of the facility was projected to be completed in 2026.

In October, a mining company broke ground for construction of an antimony mine in Idaho. In November, another company announced that mining started at the Stibnite Hill Mine in Montana.

In New York, a zinc producer continued development of the Kilbourne graphite deposit, and the same company also began construction of a graphite demonstration plant to produce natural graphite concentrate for qualification purposes. Another company commissioned a spherical purified graphite qualification line at its plant in Kellyton, AL.

In Utah, a fluorspar mine and processing plant were under construction. A schedule for completion of construction and start of production was not available.

In September, the operator of the only U.S. primary magnesium smelter filed for Chapter 11 bankruptcy protection. Production at the plant on the Great Salt Lake in Utah decreased significantly in September 2021 after equipment failures, and limited production ceased in 2022.

In September, construction began on a tin production and processing facility in Martinsville, VA. The facility was expected to be operational by late 2026 and would process tin ore imported from Rwanda. In 2024, the company received financing for the project under the DPA, Title III.

A company in Virginia was scaling up a plant to produce titanium powder from titanium scrap metal. The plant started production in late 2024 and planned to reach its production capacity of 1,400 tons per year in 2027.

U.S. Production and Consumption of Critical Minerals in 2025

The Final 2025 List of Critical Minerals included the addition of 10 mineral commodities that were not in the 2022 edition—boron, copper, lead, metallurgical coal, phosphate rock, potash, rhenium, silicon, silver, and uranium. The total value of domestic production for these 10 new commodities totaled $44.7 billion in 2025 and $42.6 billion in 2024. The total value of all 60 mineral commodities on the 2025 list was $48.1 billion in 2025 and $46.2 billion in 2024. In 2025, metallurgical coal contributed the most (57%) to the value of domestic production of critical minerals, followed by copper (23%) and zinc (5%). The value of domestic production of rare earths increased by 20% in 2025 to total and estimated $240 million. Of the 55 critical minerals for which prices were tracked, prices of 36 increased year-over-year, whereas prices of 15 decreased year-over-year.

Of the 60 mineral commodities included in the Final 2025 List of Critical Minerals, the United States was 100% net import reliant for 13 mineral commodities, and an additional 20 critical mineral commodities (including 14 lanthanides, which are listed under rare earths) had a net import reliance of at least 50% but less than 100% of apparent consumption. Counting the lanthanides as a single category, China was the primary import source for 8 of these 33 mineral commodities. The United States had secondary production for 15 critical minerals, which resulted in net import reliance being less than 100%. The total value of domestically recycled critical mineral commodities in 2025 was $18 billion. Recycling provided the only source of domestic supply for antimony, bismuth, chromium, magnesium metal, tin, tungsten, and vanadium.

China was the leading producer for 20 of the 60 critical minerals (including 14 lanthanides, which are listed under rare earths) for which information was available to make reliable estimates. Other leading producing countries of critical minerals included South Africa with three critical minerals (chromium, manganese, and platinum), and Australia (lithium and zirconium), Chile (copper and rhenium), and Congo (Kinsasha) (cobalt and tantalum) with two critical minerals each (table 7).

Production of most critical minerals was highly concentrated (50% or more) in a single country. Six critical minerals had 80% or more of global production dominated by one country, 6 critical minerals had 70% to 79% of global production dominated in a single country, 17 critical minerals (including the 14 lanthanides listed under rare earths) had 60% to 69% of global production dominated in a single country, and 2 critical minerals had 50% to 59% of global production dominated in a single country (table 7).

Figure 9 shows the trends in U.S. net import reliance for critical minerals over the past 20 years. For most critical minerals, the United States has remained heavily dependent on foreign sources for its consumption requirements. Notable exceptions include beryllium and boron where the United States was a net exporter for most or all of the past 20 years. Lead, nickel, phosphate rock, tellurium, vanadium, and zirconium all have a net import reliance which was below 50% in 2025, but several of these mineral commodities have had net import reliance greater than 50% in multiple years over the past 20 years.

Figure 10*A* shows the 1-year percent change in prices of critical mineral commodities between 2024 and 2025, and figure 10*B* shows the 5-year compound annual growth rate (CAGR) in the prices for critical minerals from 2021 through 2025. In 2025, the 1-year percent change in the prices of antimony, bismuth, and germanium increased by more than 100% compared with their respective prices in 2024. These changes were attributed to export restrictions. Prices increased by more than 20% for cerium oxide, cobalt, gallium, indium, neodymium oxide, platinum, praseodymium, rhenium metal, rhodium, ruthenium, samarium oxide, silver, tellurium, terbium oxide, tungsten concentrate, and ytterbium oxide. The CAGR for many critical minerals has been positive over the past 5 years, but there is a trend of decreasing prices for some mineral commodities: cobalt, dysprosium oxide, gadolinium oxide, holmium oxide, lanthanum oxide, palladium, rhodium, silicon metal, and vanadium.

Recycling

In 2025, the estimated value of domestically recycled old scrap was $46 billion and the total value of net exports of old scrap was $13 billion (fig. 1). The total value of old scrap domestically recycled, imported, and exported was $73 billion. The mineral commodities with the highest value of domestically recycled old scrap as a percentage of the commodity's total old scrap value (domestically recycled, imported, and exported) were antimony, lead, and tin. Antimony and lead were primarily consumed and recycled in lead-acid batteries. The mineral commodities with the highest value of exports in proportion to total old scrap value, in descending order, were copper, silver, aluminum, chromium, and titanium. In 2025, domestic secondary processing capacity of copper increased because one new secondary smelter became operational. Another secondary copper plant was under construction and there were three secondary aluminum facilities under construction in 2025. The mineral commodities with the highest value of imports in proportion to total old scrap value, in descending order, were titanium, magnesium metal, chromium, cobalt, and platinum-group metals (fig. 13).

In 2025, the value of domestically recycled old scrap was estimated to be $45 billion. This was 40% of the value of domestically mined mineral raw materials. Fifteen critical minerals were domestically recycled in 2025 with an estimated value of $18 billion; data for tantalum were not available and data for tungsten were withheld so their values were not included in the total value. The value of old scrap exported and imported was an estimated $21 billion and $8 billion, respectively. The total value of old scrap domestically recycled, imported, and exported was an estimated $73 billion. This analysis did not include three commodities that were domestically recycled but for which data were unavailable or withheld from this report to protect proprietary company information.

Iron and steel (old scrap) was the most recycled commodity in the United States, by value, in 2025, followed, in descending order, by aluminum and gold. Antimony, lead, and tin were the most domestically recycled commodities by value, proportional to imports and exports. Copper, silver, and aluminum were the most exported scrap commodities, by value, relative to domestic recycling and imports. Titanium, magnesium metal, and chromium were the most imported scrap commodities, by value, relative to domestic recycling and exports (fig. 13).

In 2025, six new recycling plants were operational, including one aluminum recycling plant in Kentucky, one secondary copper plant in Kentucky, one newly expanded aluminum facility in Minnesota, one plant in South Carolina that began metal recovery from lithium-ion battery scrap in 2025, and one plant in Georgia that began recovering copper, nickel, tin, and precious metals from mixed metal scrap including printed circuit boards. One facility in Virginia began commercial production of titanium powder from scrap in late 2024 and worked to ramp up production in 2025. Six recycling plants were under construction or being expanded in 2025, including secondary plants that recycle aluminum and facilities that recover multiple metals from lithium-ion battery scrap or electronic circuit board scrap.

In 2025, the DOW awarded $5.1 million toward the recovery of rare earth elements from magnet scrap, and the EXIM Bank approved a $27.4 million loan to advance manufacturing of nickel and titanium metal powder and alloys from scrap. This discussion of facilities and funding excluded steel scrap recycled as part of electric arc furnace operations.

Foreign Trade

China was the dominant global producer for many mineral materials, and many of those materials were on the United States Final 2025 List of Critical Minerals. In 2025, the Government of China implemented trade restrictions on several mineral commodities on the United States List of Critical Minerals, including several of the rare-earth elements and other mineral commodities for which China was a dominant producer. Other countries that implemented trade restrictions on critical minerals in 2025 included Congo (Kinshasa) for cobalt, Gabon for manganese, and Malaysia for rare earths. See the "Significant Events, Trends, and Issues" section beginning on page 7 and table 4 on page 16 for more details on trade actions.

U.S. Geological Survey Earth Mapping Resources Initiative for Critical Minerals

The USGS Earth Mapping Resources Initiative (Earth MRI) is a collaborative effort between the USGS and State geological surveys to collect high-quality geologic, geophysical, and light detection and ranging (lidar) data to modernize the Nation's geologic mapping and provide vital information about critical mineral resources both in ground and above ground in mine waste. Earth MRI is a data collection engine within the USGS Mineral Resources Program (MRP); the initiative began in 2019, and then data collection and critical mineral mapping were expanded and accelerated by 5 years of supplemental funding beginning in 2022. In fiscal year 2025, the USGS invested more than $61 million across 38 States through Earth MRI to fund geoscience data collection and mapping in partnership with State geological surveys, data preservation programs, and scientific interpretation efforts to identify areas of the country with potential for critical mineral resources.

Priority areas for new data collection extend across the country and are guided by the "National Map of Focus Areas for Potential Critical Mineral Resources in the United States," which was initially released in 2023 (USGS Fact Sheet 2023–3007). Mapping of focus areas was based on a framework of mineral systems and their associated mineral deposit types and possible critical mineral enrichments. The focus areas helped to guide planning and prioritization of new geologic, geophysical, geochemical, and topographic data collection across prospective regions of the country. The focus areas were initially described as they related to the 2022 List of Critical Minerals, but the mineral systems framework includes all possible mineral resource associations and elemental enrichments. Thus, the previously published USGS critical mineral focus areas already account for nonfuel mineral commodities and uranium that were added to the Final 2025 List of Critical Minerals.

A significant part of Earth MRI data collection in 2025 involved direct partnerships with 34 State geological surveys. State surveys conduct bedrock geologic mapping and reconnaissance geochemical surveys that provide essential insights into critical mineral enrichments across a wide variety of mineral systems. State surveys contribute directly to USGS efforts to inventory and characterize mine waste at legacy and active sites, and they also were offered Earth MRI funding to preserve legacy geologic data and reanalyze archived samples through the USGS National Geological and Geophysical Data Preservation Program (NGGDPP). In 2025, Earth MRI funded 25 new geologic and (or) reconnaissance geochemical mapping projects through cooperative agreements, with each project being conducted by a different State survey. Thirteen State surveys were funded for new mine waste inventory and (or) characterization projects. Twelve States were funded for critical mineral data preservation through the NGGDPP, and every dollar awarded through this program was matched by the State. In total, Earth MRI invested more than $17.5 million directly into State geological surveys for critical mineral mapping in 2025.

Airborne magnetic and radiometric surveys.—High-resolution airborne magnetic and radiometric surveys are one of the core data types funded by Earth MRI since the initiative began in 2019, and these geophysical surveys aid bedrock geologic mapping and modeling of regions prospective for hosting critical mineral resources. In 2025, Earth MRI invested more than $37 million to collect airborne magnetic and radiometric data in multiple regions of the country. New airborne surveys funded in Alaska helped to complete data collection across the Kuskokwim Mountains region in the southwestern part of the State and will also cover parts of the Seward Peninsula in western Alaska. The Kuskokwim Mountains region is part of the Tintina gold belt, which contains known antimony, rare earth element, tin, and tungsten deposits and has high potential for other undiscovered critical mineral resources. The Seward Peninsula contains the Graphite Creek deposit, the largest known flake graphite deposit in the United States, and its diverse geology is also known or suspected to host other critical mineral resources such as those associated with the Kougarok district.

In the western United States, magnetic-radiometric surveys funded in 2025 cover critical mineral focus areas across parts of Colorado, Idaho, New Mexico, Montana, Nevada, Oregon, South Dakota, Utah, and Wyoming. Companion bedrock geological mapping, reconnaissance geochemical mapping, and mine waste investigations were also started or were ongoing in many of these States. New geophysical data collection in southern Colorado focused on the northern part of a regional alkaline igneous belt that extends along the southern Rocky Mountains to the Big Bend region of western Texas. New airborne geophysical surveys in Wyoming cover a broad region containing the Hartville uplift, the Laramie Mountains, and the Shirley Mountains in the south-central part of the State. When completed, these surveys will connect with published and recently completed Earth MRI geophysical surveys in western Colorado and southern Wyoming, providing new insights into multiple mineral systems across a broad region of the Rocky Mountains. A new airborne survey in western South Dakota and northeastern Wyoming covers the entirety of the Black Hills and extends north across the Bear Lodge rare earth element deposit and other associated alkaline intrusions. A new survey in western Montana extends across the Big Belt Mountains and the Little Belt Mountains to cover the northeastern extent of porphyry-related igneous intrusions in the region. Airborne magnetic and radiometric data collection across the Idaho-Montana border to the northwest supports mapping of the Proterozoic Belt Supergroup in the region and covers the entire Coeur d'Alene mining district. New airborne magnetic-radiometric data collection in Nevada will cover approximately 23,569 square kilometers of the eastern part of the State extending into western Utah. Survey targets include Carlin-type, porphyry copper, reduced intrusion-related, and lacustrine evaporite mineral systems that are prospective for critical minerals such as antimony, beryllium, lithium, tellurium, tin, and tungsten.

In the central United States, a new airborne magnetic-radiometric survey spans more than 88,059 square kilometers of northcentral Missouri and adjacent parts of western Illinois, eastern Iowa, and southwestern Wisconsin to investigate basin-brine path, iron oxide apatite-iron oxide copper gold (IOA-IOCG), and marine chemocline mineral systems. The survey also encompasses regionally extensive Paleozoic phosphatic strata that are prospective for rare earth elements. Another new geophysical survey was initiated over a broad region of northeastern Minnesota that includes the

Duluth Complex, a large mafic magmatic system that hosts nickel, cobalt, and platinum-group elements.

In the eastern United States, three major airborne magnetic-radiometric surveys were initiated in 2025. A new survey covering a large part of northeastern Maine will support mapping across multiple mineral systems and geologic provinces that have potential for various critical minerals. The survey extends along much of the border between eastern Maine and western New Brunswick, Canada; the resulting data may facilitate correlation of geologic units and mineral systems across the international border.

In the southeastern United States, active surveys in North Carolina and Virginia were extended to the north and west to encompass the Blue Ridge Mountains and northern Piedmont of Virginia. The survey extensions will also link Earth MRI data to the south and north, resulting in seamless, high-quality magnetic and radiometric data coverage from eastern Pennsylvania to southern South Carolina. A new survey in western Georgia extends south from crystalline rocks of the Piedmont province to sediments and sedimentary rocks of the Atlantic and Gulf Coastal Plain. The resulting data may improve modeling of major geotectonic features across the southern Appalachian Mountains and support mapping of mineral systems that include heavy mineral sands, deeply weathered regolith overlying diverse igneous rock suites, volcanogenic massive sulfide systems, and possible eastern extensions of the Alabama graphite-vanadium belt.

Airborne electromagnetic surveys.—Airborne electromagnetic surveys (AEM) were added to the Earth MRI data collection portfolio beginning in 2023 and are chiefly designed to support mapping and modeling of mineral systems and geotectonic features that have strong subsurface conductivity signatures. In 2025 Earth MRI invested approximately $1.5 million in regional and more focused AEM surveys in the western and central United States, continuing two multiyear survey efforts in Wyoming and Michigan, respectively. The first phase of the Wyoming AEM survey covers a broad swath across the southern part of the State and focuses on the Cheyenne Belt, a major Precambrian tectonic zone that juxtaposes disparate mineral systems associated with crystalline basement terranes of different ages on either side. The tectonic zone crops out in limited exposures across multiple mountain ranges in southern Wyoming, but the structure is concealed by younger sedimentary cover across much of its extent. The second phase of the Wyoming AEM survey will extend to the northeast and, when completed, will cover a broad region that extends to the Black Hills in southwestern South Dakota. A regional AEM survey in the upper peninsula of northern Michigan and environs was completed in 2025 and is supporting mapping and modeling of Precambrian terranes that include graphite-bearing strata of the Marquette Range Supergroup and mafic magmatic rocks of the Midcontinent Rift System that may contain nickel, cobalt, and platinum group elements. The Michigan AEM survey was also optimized in selected areas to facilitate groundwater modeling in support of Tribes in the region. The second phase of the survey extends west along Lake Superior and covers a broad region of northeastern Minnesota that includes the Animikie Basin, Cuyuna Range, and Duluth Complex.

Airborne hyperspectral remote sensing surveys.—In 2025, Earth MRI invested more than $4 million in new hyperspectral remote sensing data in the western United States as part of a 4-year, $16 million partnership with National Aeronautics and Space Administration (NASA). Hyperspectral data collection began in 2023 using NASA's ER-2 high-altitude airborne science aircraft and the Airborne Visible/Infrared Imaging Spectrometer (AVIRIS-Classic). The new AVIRIS-5 sensor was installed and began collecting data in 2025, increasing spatial resolution by approximately 4 times and spectral resolution by at least 2 times. Secondary thermal infrared sensors such as MASTER and HyTES are also being used as available. To date, new hyperspectral data have been collected over parts of Arizona, California, Idaho, Nevada, New Mexico, Oregon, Texas, and Utah. The average pixel size ranges from 8 to 17 meters, and reflectance data are calibrated by concurrent ground studies conducted by USGS scientists. In 2025, new data coverage totaled approximately 466,198 square kilometers of the western and southwestern United States. When combined with data collected through Earth MRI in 2023–24 and with legacy data funded by the USGS Mineral Resources Program in 2018, available coverage of these hyperspectral data exceeds 1.24 square kilometers, which, as of 2025, is the largest terrestrial area of contiguous hyperspectral coverage at 15-meter spatial resolution or better. The hyperspectral data are being used to develop high-resolution mineral maps of the Earth's surface and to support detailed geologic mapping of mineral systems by State survey partners.

In 2025, Earth MRI also conducted a district-scale hyperspectral survey over select sites in southern Missouri and northeastern Oklahoma to aid mapping and characterization of critical minerals in mine waste. The selected areas included the Old Lead Belt and Tar Creek sites, two legacy lead-zinc mine sites in the Tri-State Mining District of Missouri and Oklahoma. The third selected area covered the Pea Ridge iron oxide apatite-iron oxide copper gold (IOA-IOCG) deposit in eastern Missouri to better map rare earth element-bearing minerals in mine waste at the site. District-scale hyperspectral data were collected by a commercial vendor using 2.5-meter resolution FENIX (very-near infrared, near infrared, and short-wavelength infrared) and 5.1-meter OWL (long-wavelength infrared) sensors. The two selected sites in Missouri are already covered by new high-resolution radiometric data, and mine waste at all three sites are the focus of Earth MRI-funded characterization studies being conducted by the Missouri and Oklahoma geological surveys.

Detailed descriptions of these and other USGS Earth MRI-funded projects including points of contact and links to resulting data (when available) can be accessed using the Earth MRI Acquisitions Viewer (https://ngmdb.usgs.gov/emri/).

Table 7.—Estimated Salient Critical Minerals Statistics in 2025[1]

(Metric tons, mine production, unless otherwise specified)

Critical mineral	United States: Primary production	United States: Secondary production	United States: Apparent consumption	United States: Net import reliance as a percentage of apparent consumption	United States: Primary import source (2021–24)	World: Leading producing country	World: Production in leading country	World: Percent of world total	World: World production total
Aluminum (bauxite)	W	NA	[2]1,700,000	>75	Jamaica	Guinea	150,000,000	34	[3]440,000,000
Antimony	W	3,500	45,000	91	China[4]	China	40,000	36	110,000
Arsenic	—	NA	6,300	100	China[4]	Peru	[5]30,000	49	[5]61,000
Barite	W	NA	W	>75	India	India	3,000,000	34	[3]8,700,000
Beryllium	230	NA	230	E	Kazakhstan	United States	230	53	430
Bismuth[6]	—	80	1,000	92	China[4]	China	14,000	88	16,000
Boron	W	NA	W	E	Turkey	Turkey	1,500,000	W	W
Chromium	—	100,000	480,000	79	South Africa	South Africa	23,000,000	45	51,000,000
Cobalt	300	2,000	9,600	79	Norway	Congo (Kinshasa)	230,000	74	310,000
Copper	1,000,000	60,000	2,200,000	57	Chile	Chile	5,300,000	23	23,000,000
Fluorspar	NA	NA	370,000	100	Mexico	China	6,000,000	60	10,000,000
Gallium	—	NA	[2]19	100	Canada	China	900	100	900
Germanium[6]	—	NA	NA	>50	Belgium	China	NA	NA	NA
Graphite (natural)	—	—	71,000	100	China[4]	China	1,400,000	78	1,800,000
Indium[6]	—	NA	220	100	Republic of Korea	China	760	69	1,100
Lead	270,000	1,000,000	1,500,000	33	Canada	China	1,900,000	42	4,500,000
Lithium	W	NA	W	>50	Chile	Australia	92,000	32	[3]290,000
Magnesium[6]	—	110,000	[2]40,000	>75	Israel	China	[7]950,000	86	[7]1,100,000
Manganese	—	NA	640,000	100	Gabon	South Africa	7,600,000	37	20,000,000
Nickel	10,000	W	[8]220,000	41	Canada	Indonesia	2,600,000	67	3,900,000
Niobium	—	NA	9,900	100	Brazil	Brazil	104,000	93	112,000
Palladium	6	50	130	57	South Africa	Russia	84	44	190
Phosphate rock	20,000,000	NA	21,000,000	16	Peru	China	110,000,000	44	250,000,000
Platinum	2	9	92	89	South Africa	South Africa	120	71	170
Potash	500,000	NA	5,900,000	92	Canada	Canada	15,000,000	31	49,000,000
Rare earths (compounds and metals)[9]	8,900	NA	27,000	67	China[4]	China	270,000	69	390,000
Rhenium	10	NA	38	75	Chile	Chile	30	37	81
Scandium	—	—	NA	100	Japan[10]	China	NA	NA	80
Silicon	W	NA	W	>50	Brazil	China	4,000,000	87	[3]4,600,000
Silver	1,100	1,000	9,400	77	Mexico	Mexico	6,300	24	26,000
Tantalum	—	NA	890	100	China[4]	Congo (Kinshasa)	1,300	52	2,500
Tellurium[6]	W	NA	W	>25	Canada	China	800	80	[3]1,000
Tin	—	17,000	43,000	77	Peru	China	71,000	24	290,000
Titanium (metal)[6]	0	NA	[3]44,000	100	Japan	China	260,000	70	370,000
Tungsten	—	W	W	>50	China[4]	China	67,000	79	85,000
Vanadium	—	7,500	13,000	41	Canada	China	82,000	75	110,000
Yttrium	NA	NA	300	100	China[4]	China	NA	NA	NA
Zinc	[11]220,000	([11])	820,000	73	Canada	China	4,100,000	32	13,000,000
Zirconium (ores and concentrates)	<100,000	NA	<100,000	<25	South Africa	Australia	400,000	33	1,200,000

E Net exporter. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.

[1]Critical minerals as published in the Federal Register on November 7, 2025 (90 FR 50494). Not all critical minerals are listed here. Cesium, hafnium, iridium, metallurgical coal, rhodium, rubidium, ruthenium, and uranium are not shown because available information is insufficient to make estimates of U.S. or world production.

[2]Reported consumption.

[3]Excludes U.S. production.

[4]Includes Hong Kong.

[5]Arsenic trioxide.

[6]Refinery production.

[7]Smelter production.

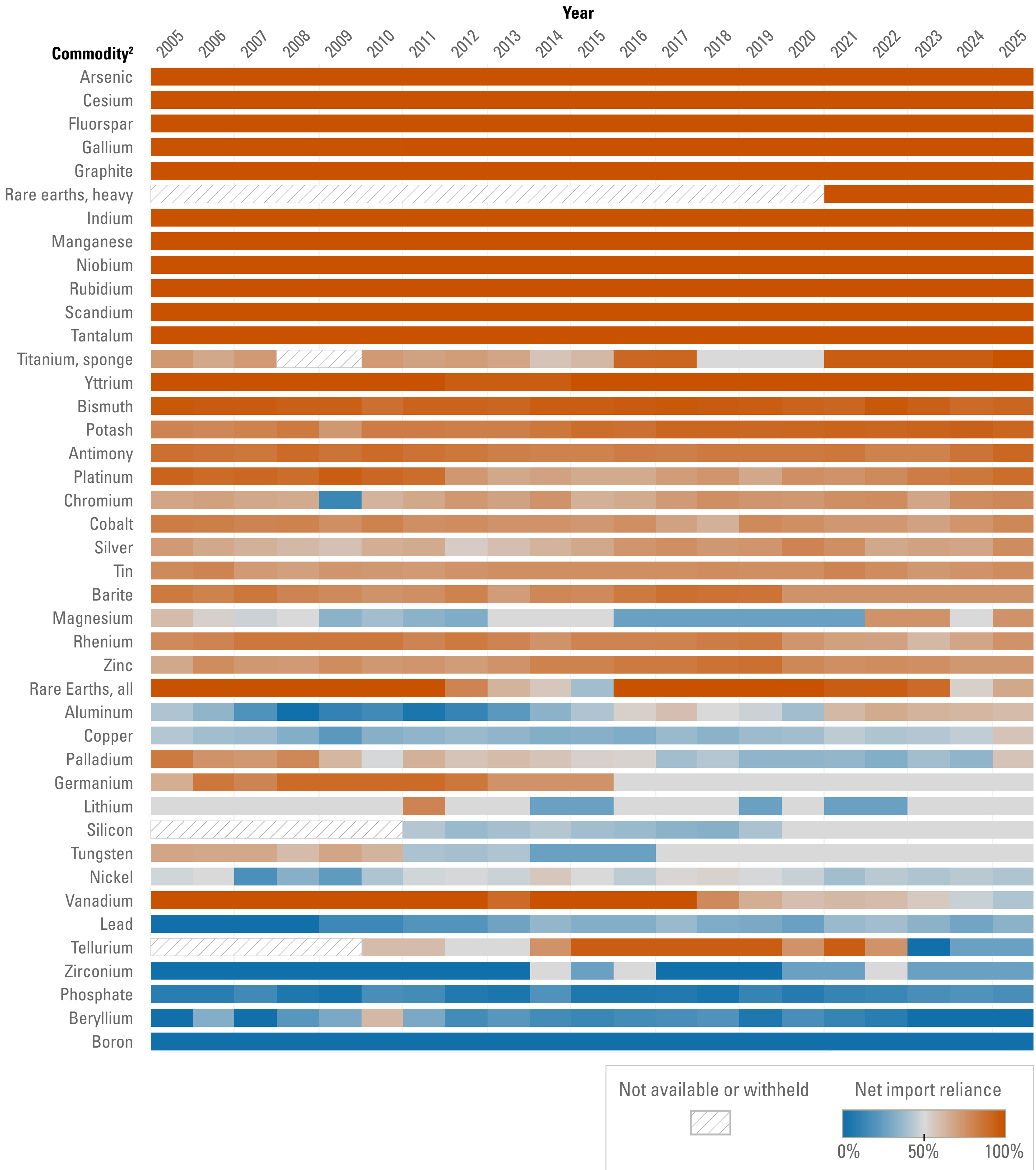
[8]Nickel in primary metal and secondary scrap.

[9]Data include lanthanides cerium, dysprosium, erbium, europium, gadolinium, holmium, lanthanum, lutetium, neodymium, praseodymium, samarium, terbium, thulium, and ytterbium.

[10]Imports reported as Philippine in origin were reassigned to Japan because the finished scandium oxide was refined in Japan from Philippine scandium-oxalate feedstocks.

[11]Primary production includes both primary and secondary metal production.

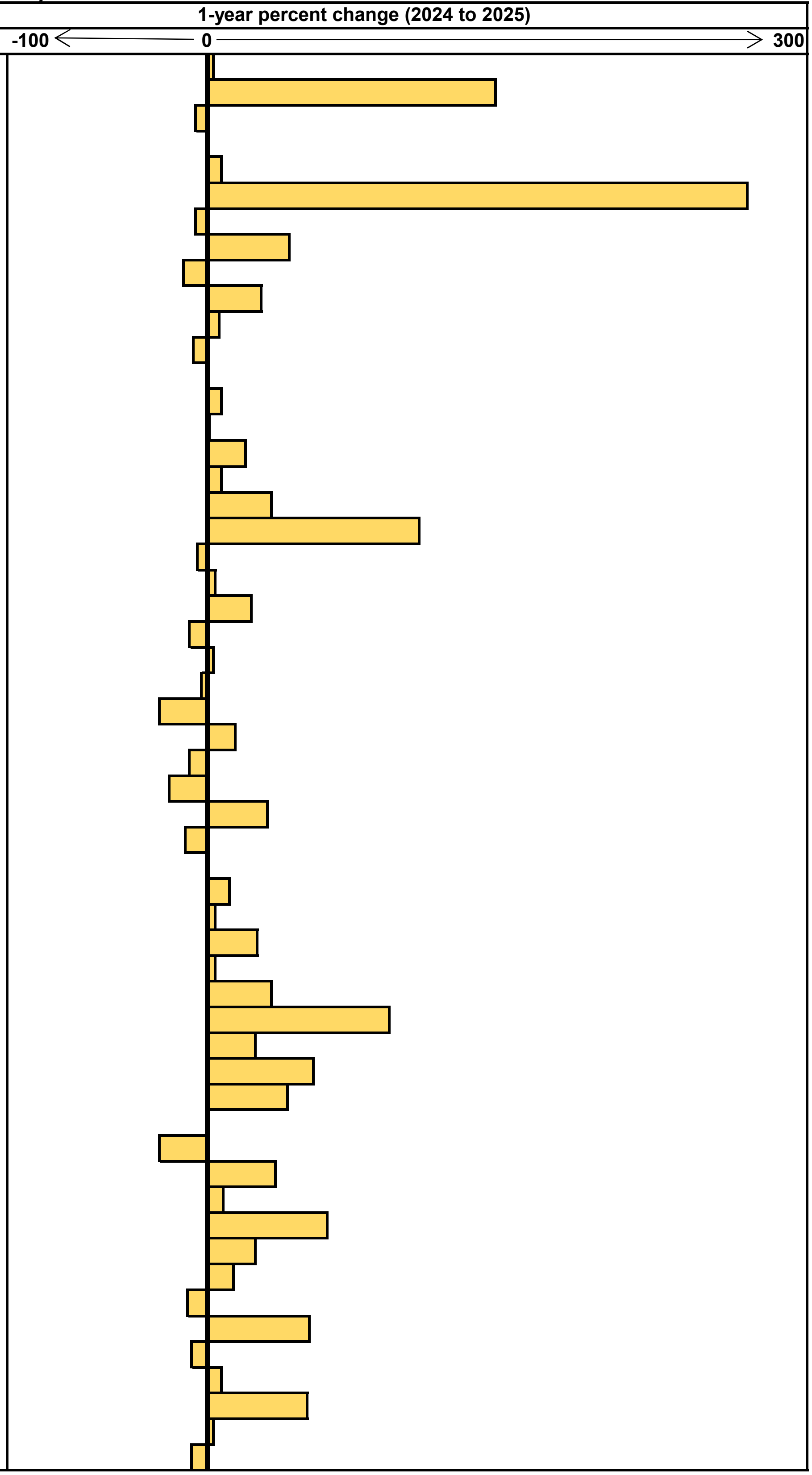
Figure 9.—20-Year Trend of U.S. Net Import Reliance for Critical Minerals[1]



[1]Net import reliance is caluclated as a percentage of apparent or estimated consumption.
[2]Excludes hafnium, iridium, metallurgical coal, rhodium, and uranium due to insufficient data. Graphite is limited to natural graphite. Magnesium is limited to metal. Rare earths are limited to compounds and metals. Silicon includes ferrosilicon and silicon metal. Tin is limited to refined tin. Zinc is limited to refined zinc. Zirconium is limited to ores and concentrates.

Figure 10A.—Estimated 1-Year Percent Change and 5-Year Compound Annual Growth Rate (CAGR) in Prices of Critical Minerals[1]

Critical mineral (price source)[2]	Percent
Aluminum, bauxite[3]	3
Antimony, metal	144
Arsenic, metal	-6
Barite	0
Beryllium[3]	7
Bismuth	270
Boron[3]	-6
Cerium, oxide	41
Chromium, chromite ore	-12
Cobalt (U.S. spot cathode)	27
Copper (LME)	6
Dysprosium, oxide	-7
Europium, oxide	0
Erbium, oxide	7
Fluorspar, acid grade[3]	1
Fluorspar, metallurgical grade[3]	19
Gadolinium, oxide	7
Gallium[3]	32
Germanium, metal	106
Graphite, natural, flake[3]	-5
Holmium, oxide	4
Indium (Rotterdam)	22
Iridium	-9
Lanthanum, oxide	3
Lead	-3
Lithium, battery-grade lithium carbonate	-24
Lutetium, oxide	14
Magnesium, metal (U.S. spot Western)	-9
Manganese	-19
Neodymium, oxide	30
Nickel	-11
Niobium, ferroniobium[3]	0
Palladium	11
Phosphate rock	4
Platinum	25
Potash, all products	4
Praseodymium, oxide	32
Rhenium, metal	91
Rhodium	24
Ruthenium	53
Samarium, oxide	40
Scandium, ingot	0
Silicon, metal	-24
Silver	34
Tantalum	8
Tellurium (U.S.)	60
Terbium, oxide	24
Tin (New York dealer)	13
Titanium, sponge[3]	-10
Tungsten, concentrate	51
Vanadium, vanadium pentoxide	-8
Yttrium, oxide	7
Ytterbium, oxide	50
Zinc (LME)	3
Zirconium, sponge	-8



LME London Metals Exchange.

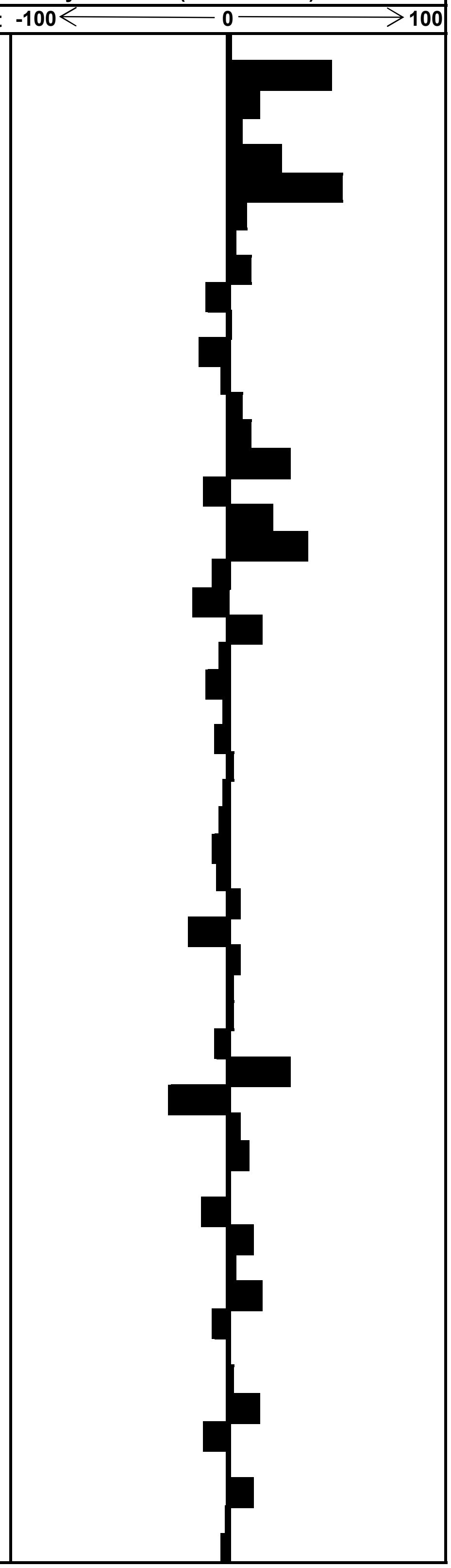
[1]Critical minerals as published in the Federal Register on November 7, 2025 (90 FR 50494). Not all critical minerals are listed here. Cesium, hafnium, metallurgical coal, rubidium, thulium, and uranium are not shown because there was not enough information available regarding prices.

[2]Price source is only included for those commodities that have multiple price sources in their Salient table. For those commodities with a single price source, please refer to that commodity chapter's Salient table.

[3]Average annual unit value of imports.

Figure 10*B*.—Estimated 1-Year Percent Change and 5-Year Compound Annual Growth Rate (CAGR) in Prices of Critical Minerals[1]

Critical mineral (price source)[2]	5-year CAGR (2021 to 2025) Percent
Aluminum, bauxite[3]	1
Antimony, metal	47
Arsenic, metal	14
Barite	6
Beryllium[3]	24
Bismuth	52
Boron[3]	8
Cerium, oxide	3
Chromium, chromite ore	10
Cobalt (U.S. spot cathode)	-10
Copper (LME)	1
Dysprosium, oxide	-13
Europium, oxide	-3
Erbium, oxide	6
Fluorspar, acid grade[3]	10
Fluorspar, metallurgical grade[3]	28
Gadolinium, oxide	-11
Gallium[3]	20
Germanium, metal	36
Graphite, natural, flake[3]	-7
Holmium, oxide	-16
Indium (Rotterdam)	15
Iridium	-4
Lanthanum, oxide	-10
Lead	-2
Lithium, battery-grade lithium carbonate	-6
Lutetium, oxide	2
Magnesium, metal (U.S. spot Western)	-2
Manganese	-4
Neodymium, oxide	-7
Nickel	-5
Niobium, ferroniobium[3]	5
Palladium	-18
Phosphate rock	5
Platinum	2
Potash, all products	2
Praseodymium, oxide	-6
Rhenium, metal	28
Rhodium	-27
Ruthenium	5
Samarium, oxide	9
Scandium, ingot	0
Silicon, metal	-12
Silver	11
Tantalum	3
Tellurium (U.S.)	15
Terbium, oxide	-7
Tin (New York dealer)	0
Titanium, sponge[3]	2
Tungsten, concentrate	14
Vanadium, vanadium pentoxide	-11
Yttrium, oxide	0
Ytterbium, oxide	11
Zinc (LME)	-1
Zirconium, sponge	-3



LME London Metals Exchange.

[1]Critical minerals as published in the Federal Register on November 7, 2025 (90 FR 50494). Not all critical minerals are listed here. Cesium, hafnium, metallurgical coal, rubidium, thulium, and uranium are not shown because there was not enough information available regarding prices.

[2]Price source is only included for those commodities that have multiple price sources in their Salient table. For those commodities with a single price source, please refer to that commodity chapter's Salient table.

[3]Average annual unit value of imports.

Figure 11.—Change in U.S. Consumption of Nonfuel Mineral Commodities From 2024 to 2025

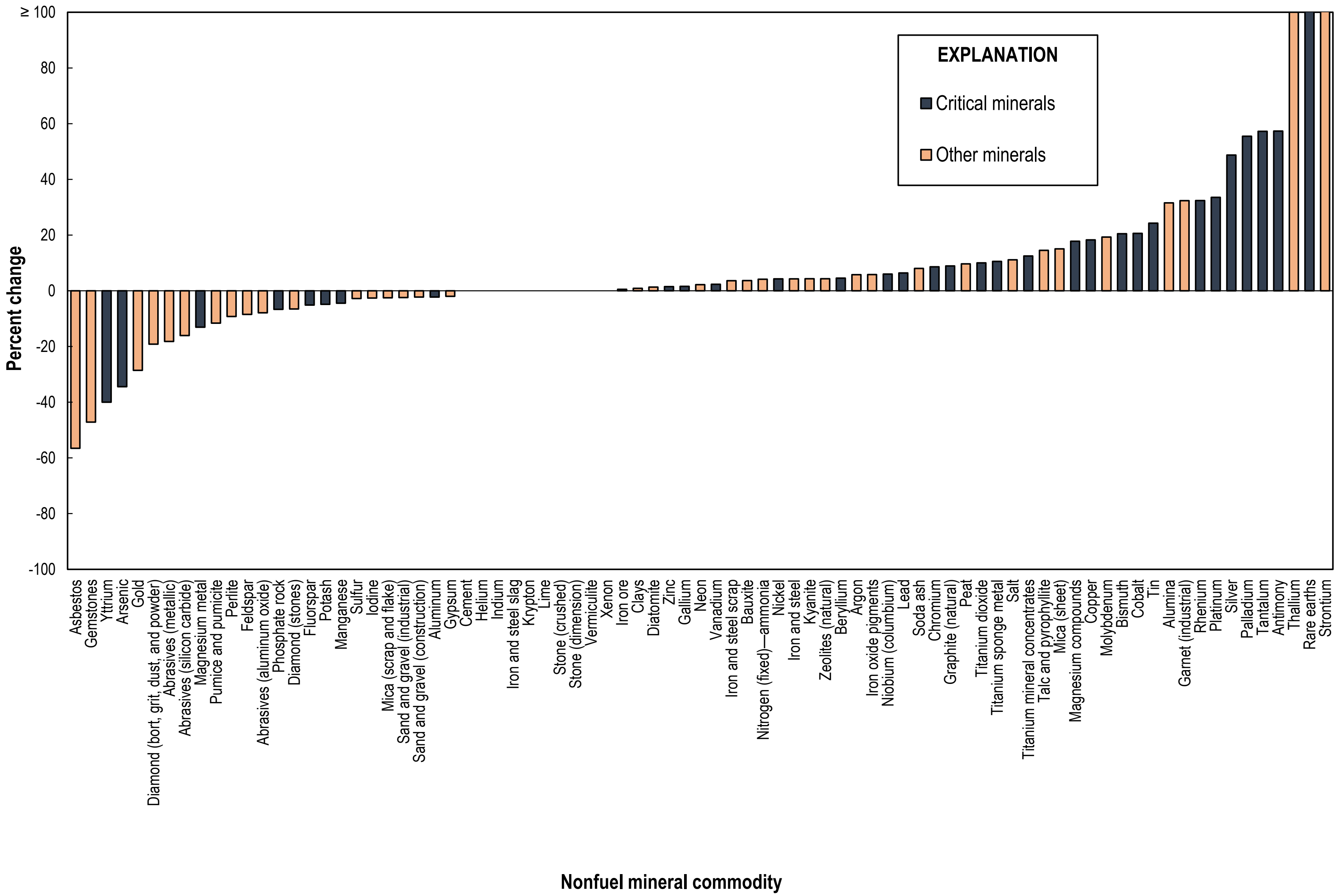


Figure 12.—Change in U.S. Consumption of Nonfuel Mineral Commodities From 2021 to 2025

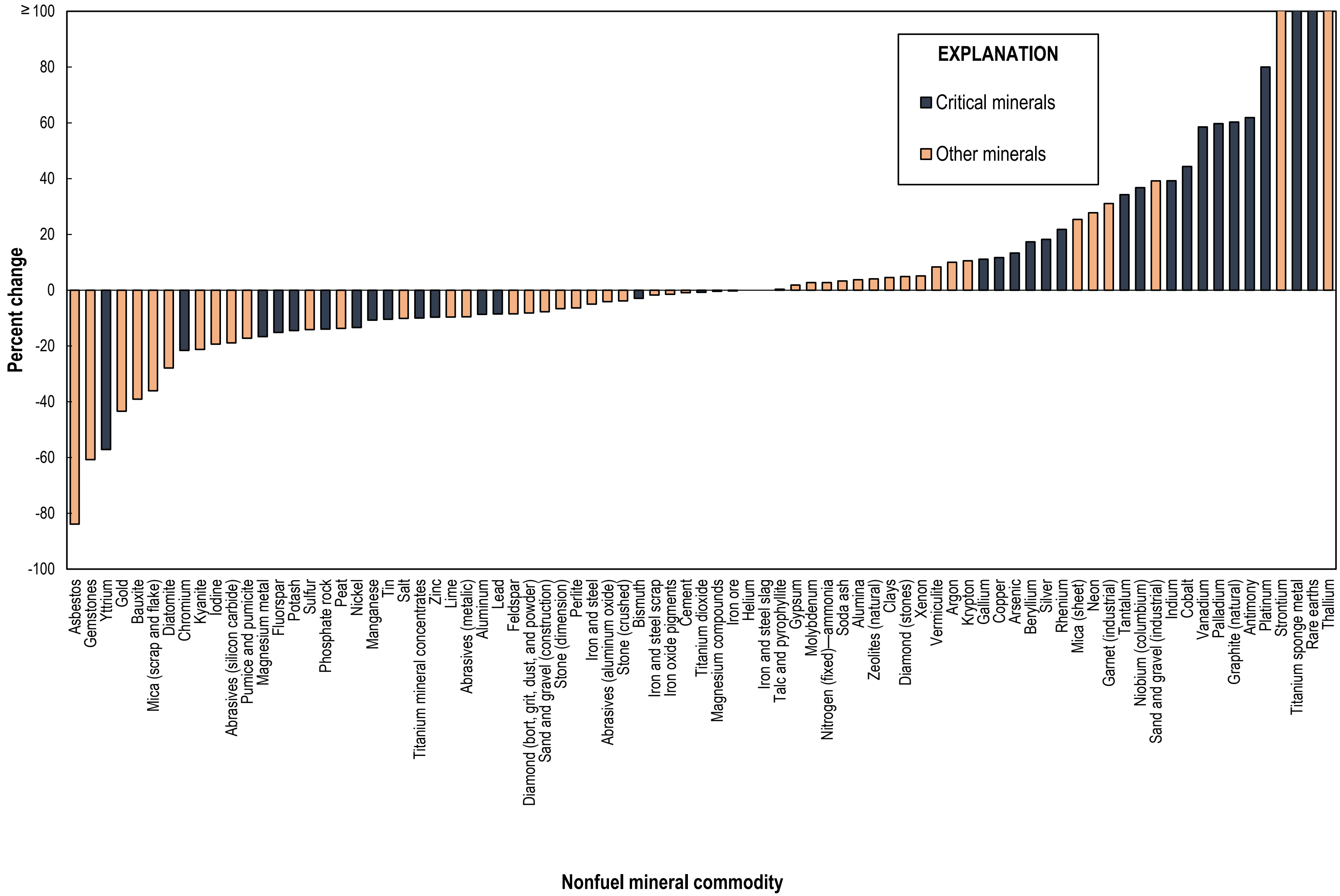
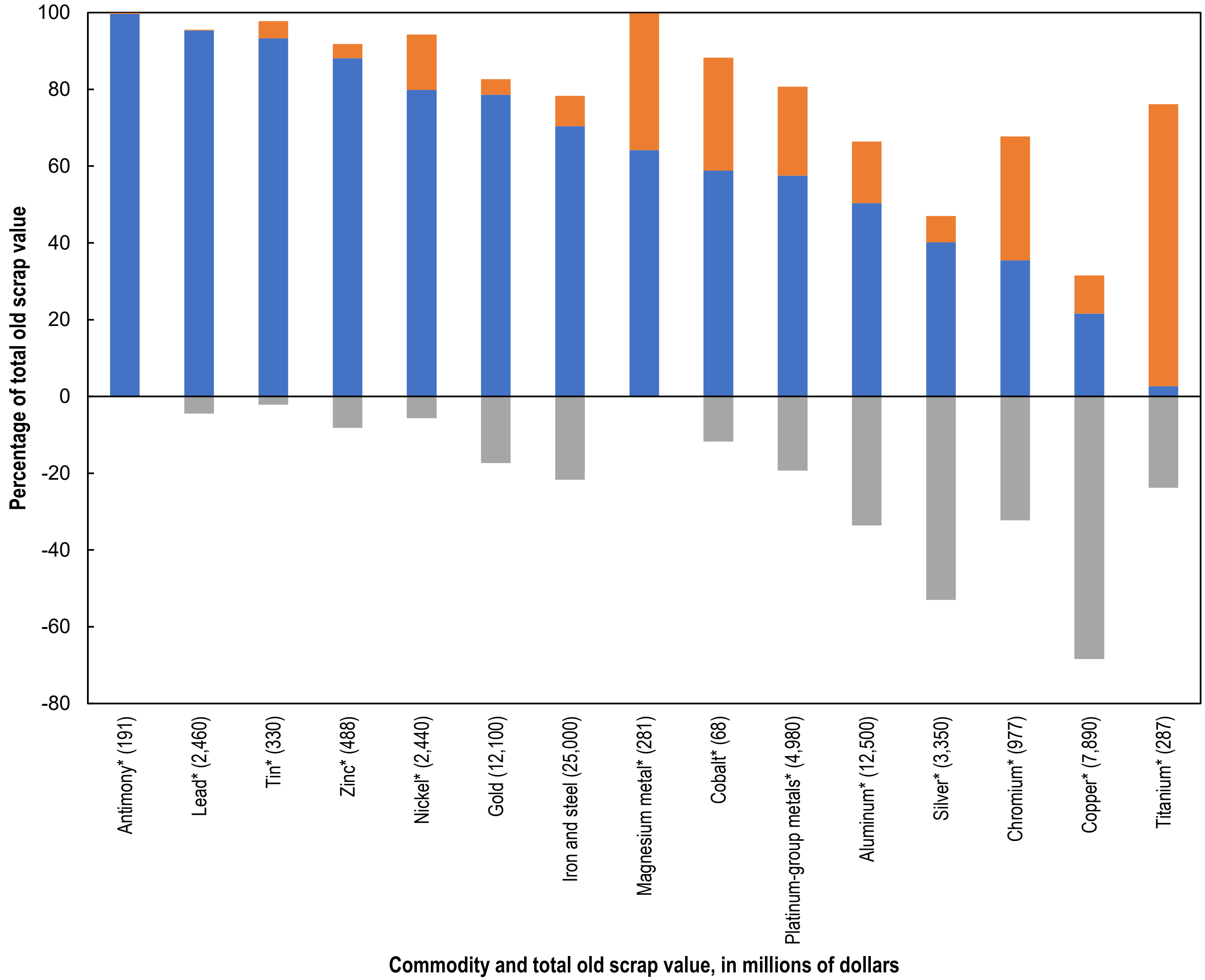


Figure 13.—2025 Value of Old Scrap Domestically Recycled, Imported, and Exported, as a Percentage of Total Old Scrap Value



EXPLANATION

- Old scrap exports
- Old scrap imports
- Old scrap domestically recycled

* Indicates commodity is included in the Final 2025 List of Critical Minerals

Percentages for exports, imports, and domestically recycled old scrap add to 100 percent of the total old scrap value for each commodity. Exports are shown as negative percentages to indicate value of supply lost.

Data not available for Molybdenum and Tantalum*. Data for Tungsten* are withheld.

ABRASIVES (MANUFACTURED)

(Fused aluminum oxide, silicon carbide, and metallic abrasives)
(Data in metric tons unless otherwise specified)

Domestic Production and Use: In 2025, fused aluminum oxide was produced by two companies at three plants in the United States and Canada. Production of crude fused aluminum oxide had an estimated value of $5.1 million. Silicon carbide was produced by two companies at two plants in the United States. Production of crude silicon carbide had an estimated value of about $25 million. Metallic abrasives were produced by 10 companies operating 11 plants in seven States. Production of metallic abrasives had an estimated value of about $140 million, and metallic abrasive shipments were valued at $200 million. Bonded and coated abrasive products accounted for most abrasive uses of fused aluminum oxide and silicon carbide. Metallic abrasives are primarily steel shot and grit and cut wire shot, which are used for sandblasting, peening, and stonecutting applications.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production:					
Fused aluminum oxide, crude[1, 2]	10,000	20,000	25,000	25,000	20,000
Silicon carbide[2]	35,000	40,000	45,000	40,000	30,000
Metallic abrasives	176,000	180,000	198,000	193,000	160,000
Shipments, metallic abrasives	193,000	199,000	227,000	223,000	180,000
Imports for consumption:					
Fused aluminum oxide	159,000	225,000	120,000	161,000	150,000
Silicon carbide	125,000	165,000	114,000	113,000	95,000
Metallic abrasives	26,400	20,100	17,800	16,900	16,000
Exports:					
Fused aluminum oxide	13,500	14,400	9,570	9,190	8,000
Silicon carbide	12,000	12,000	10,100	9,680	8,600
Metallic abrasives	20,100	23,900	24,100	19,300	18,000
Consumption, apparent:					
Fused aluminum oxide[3]	146,000	210,000	110,000	152,000	140,000
Silicon carbide[4]	148,000	193,000	148,000	143,000	120,000
Metallic abrasives[5]	199,000	195,000	220,000	220,000	180,000
Price, average unit value of imports, dollars per metric ton:					
Fused aluminum oxide, crude	674	797	655	635	699
Fused aluminum oxide, ground and refined	1,290	1,560	1,380	1,440	1,500
Silicon carbide, crude	587	1,080	905	832	829
Metallic abrasives	1,510	2,130	1,850	1,910	2,000
Net import reliance[6] as a percentage of apparent consumption:					
Fused aluminum oxide	>95	>95	>95	>95	>95
Silicon carbide	76	79	70	72	74
Metallic abrasives	3	E	E	E	E

Recycling: Up to 30% of fused aluminum oxide may be recycled, and about 5% of silicon carbide is recycled.

Import Sources (2021–24): Fused aluminum oxide, crude: China,[7] 92%; and other, 8%. Fused aluminum oxide, ground and refined: Canada, 27%; China,[7] 17%; Brazil, 16%; Austria, 15%; and other, 25%. Total fused aluminum oxide: China,[7] 68%; Canada, 10%; Brazil, 6%; Austria, 5%; and other, 11%. Silicon carbide, crude: China,[7] 97%; and other, 3%. Silicon carbide, ground and refined: China,[7] 61%; Brazil, 14%; Canada, 10%; Norway, 8%; and other, 7%. Total silicon carbide: China,[7] 88%; Brazil, 4%; and other, 8%. Metallic abrasives: Canada, 47%; Thailand, 11%; Turkey, 9%; Japan, 9%; and other, 24%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Artificial corundum, crude	2818.10.1000	Free.
White, pink, ruby artificial corundum, greater than 97.5% aluminum oxide, grain	2818.10.2010	1.3% ad valorem.
Artificial corundum, not elsewhere specified or included, fused aluminum oxide, grain	2818.10.2090	1.3% ad valorem.
Silicon carbide, crude	2849.20.1000	Free.
Silicon carbide, grain	2849.20.2000	0.5% ad valorem.
Iron, pig iron, or steel granules	7205.10.0000	Free.

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ABRASIVES (MANUFACTURED)

Depletion Allowance: None.

Government Stockpile: None.

Events, Trends, and Issues: In 2025, China was the world's leading manufacturer of abrasive fused aluminum oxide and abrasive silicon carbide. Imports from China, where production costs were lower, continued to challenge abrasives manufacturers in the United States and Canada. China accounted for 96% of United States imports of crude fused aluminum oxide, 15% of ground and refined fused aluminum oxide imports, 97% of crude silicon carbide imports, and 57% of ground and refined silicon carbide imports. Abrasive products from China remained subject to additional duties under U.S. section 301 actions—such as an extra 7.5% ad valorem on HTS 2818.10.2010 and Chapter 99 tariffs on HTS 2849.20.2000—on top of the Normal Trade Relations (NTR) rates, and HTS 7205.10.0000 continued to have a zero NTR rate, a 3% rate for certain countries, and an additional 25% duty for products from China under HTS 9903.88.03. Foreign competition was expected to persist and continue to limit production in North America. The import quantities of abrasive fused aluminum oxide (crude and ground and refined) in 2025 were 33% lower and 20% higher, respectively, than those in 2024. The import quantities of abrasive silicon carbide (crude and ground and refined) in 2025 were 20% and 18% lower, respectively, than those in 2024.

The United States returned to being a net exporter of metallic abrasives in 2022 through 2025 as compared with being a net importer in 2021. The import quantity of metallic abrasives in 2025 was 6% lower than that in 2024. Canada was the leading supplier of metallic abrasive imports.

The consumption of abrasives in the United States is influenced by activity in the manufacturing sectors that use them, particularly the aerospace, automotive, furniture, housing, and steel industries. The U.S. abrasive markets also are influenced by technological trends.

World Production Capacity:

	Fused aluminum oxide[e]		Silicon carbide[e]	
	2024	**2025**	**2024**	**2025**
United States	60,000	60,000	40,000	40,000
Australia	50,000	50,000	—	—
Austria	90,000	90,000	—	—
Brazil	50,000	50,000	40,000	40,000
China	800,000	800,000	450,000	450,000
France	40,000	40,000	20,000	20,000
Germany	80,000	80,000	35,000	35,000
India	40,000	40,000	5,000	5,000
Japan	15,000	15,000	60,000	60,000
Mexico	—	—	45,000	45,000
Norway	—	—	80,000	80,000
Venezuela	—	—	30,000	30,000
Other countries	80,000	80,000	200,000	200,000
World total (rounded)	1,310,000	1,300,000	1,000,000	1,000,000

World Resources:[8] Although domestic resources of raw materials for fused aluminum oxide production are limited, adequate resources are available in the Western Hemisphere. Domestic resources are more than adequate for silicon carbide production.

Substitutes: Natural and manufactured abrasives, such as emery, garnet, metallic abrasives, or staurolite, can be substituted for fused aluminum oxide and silicon carbide in various applications.

[e]Estimated. E Net exporter. — Zero.
[1]Production data for fused aluminum oxide are combined data from the United States and Canada to avoid disclosing company proprietary data.
[2]Rounded to the nearest 5,000 tons to avoid disclosing company proprietary data.
[3]Defined as imports – exports because production includes data from Canada; actual consumption is higher than that shown.
[4]Defined as production + imports – exports.
[5]Defined as shipments + imports – exports.
[6]Defined as imports – exports.
[7]Includes Hong Kong.
[8]See Appendix C for resource and reserve definitions and information concerning data sources.

ALUMINUM[1]

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: In 2025, three companies operated six primary aluminum smelters in five States. Two of these smelters operated at full capacity throughout the year, whereas two smelters operated at reduced capacity. Two smelters located in Hawesville, KY, and New Madrid, MO, have been temporarily shut down since 2022 and 2024, respectively. Domestic smelter capacity was 1.31 million tons per year in 2025, unchanged from that in 2024. Estimated primary production and secondary production from new and old scrap both decreased slightly from that in 2024. Based on published prices, the value of primary aluminum production was an estimated $2.6 billion, 35% more than that in 2024. The estimated average annual U.S. market price increased by 39% from that in 2024. Transportation applications accounted for 36% of domestic consumption; the remainder was used in packaging, 24%; building, 13%; electrical, 9%; consumer durables and machinery, 8% each; and other, 2%.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production:					
Primary	889	861	750	676	660
Secondary (from old scrap)	1,520	1,480	1,560	1,560	1,600
Secondary (from new scrap)	1,780	1,920	1,870	2,120	2,000
Imports for consumption:					
Crude and semi-fabricated products	4,940	5,730	4,900	4,840	4,400
Scrap	679	685	677	700	890
Exports:					
Crude and semi-fabricated products	900	1,040	1,240	1,360	890
Scrap	1,930	1,720	1,780	2,100	2,200
Consumption, apparent[2, 3]	6,240	6,910	6,210	5,830	5,700
Supply, apparent[3, 4]	8,020	8,820	8,070	7,950	7,700
Price, ingot, average U.S. market (spot), cents per pound[5]	138.5	152.6	125.9	129.5	180
Stocks, yearend:					
Aluminum industry	1,870	2,050	1,820	1,690	1,800
London Metal Exchange (LME), U.S. warehouses[6]	69	9	5	16	8
Employment, number[7]	28,900	30,200	30,500	29,900	30,000
Net import reliance[8] as a percentage of apparent consumption	61	66	63	62	60

Recycling: In 2025, aluminum recovered from purchased scrap in the United States was about 3.6 million tons, of which about 56% came from new scrap (manufacturing) and 44% from old scrap (discarded aluminum products). Aluminum recovered from old scrap was equivalent to about 28% of apparent consumption.

Import Sources (2021–24): Canada, 56%; United Arab Emirates, 8%; Bahrain, 4%; China,[9] 3%; and other, 29%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Aluminum, not alloyed:		
Unwrought (in coils)	7601.10.3000	2.6% ad valorem.
Unwrought (greater than 99.9% aluminum)	7601.10.6040	Free.
Unwrought (between 99.8%–99.9% aluminum)	7601.10.6045	Free.
Aluminum alloys, unwrought (billet)	7601.20.9045	Free.
Aluminum scrap:		
Used beverage container scrap	7602.00.0035	Free.
Industrial process scrap	7602.00.0095	Free.
Other	7602.00.0097	Free.

Depletion Allowance: Not applicable.[1]

Government Stockpile:[10]

	FY 2025		FY 2026	
Material	Potential acquisitions	Potential disposals	Potential acquisitions	Potential disposals
Aluminum, high-purity and alloys	3.2	—	NA	NA

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ALUMINUM

Events, Trends, and Issues: In March, the United States imposed a 25% tariff on aluminum and aluminum derivative products and ended all previously existing country-specific exemptions. The action, authorized under section 232 of the Trade Expansion Act, was intended to address national security concerns related to the volume of aluminum imports and increase domestic production capacity. By June, tariffs doubled to 50% ad valorem for most countries, except for the United Kingdom, which remained at 25%. In August, over 400 additional aluminum-related tariff codes were added, with the tariffs applying only to the aluminum content of those products.

Two aluminum sheet facilities in Virginia and West Virgina closed in May and June, respectively. Commissioning continued at a 650,000-ton-per-year recycled aluminum flat-rolled products mill in Mississippi, which in June had shipped its first coils. In July, production began at an expanded recycling plant in Minnesota, adding 55,000 tons per year of billet capacity and increasing the plant's total capacity to 165,000 tons per year. In August, plans were announced to restart more than 50,000 tons per year of idled capacity at a 229,000-ton-per-year primary aluminum smelter in South Carolina, with full production planned for mid-2026. In September, an expansion project doubled capacity at a high-purity aluminum facility in Iowa.

In San Ciprian, Spain, a 228,000-ton-per-year primary aluminum smelter restarted after stopping production in 2022, with full production expected by mid-2026. Operations were expected to begin by yearend at a 500,000-ton-per-year primary aluminum smelter in North Kalimantan, Indonesia. In China, smelters in Guangxi, Guizhou, Qinghai, Sichuan, and Yunnan Provinces resumed production, or completed upgrades, including the addition of new potlines.

World Smelter Production and Capacity: Production in 2024 for Malaysia was revised significantly based on company and Government reports. Capacity data for the United States, China, and other countries were revised based on company and Government reports.

	Smelter production		Yearend capacity	
	2024	2025[e]	2024	2025[e]
United States	676	660	1,310	1,310
Australia	1,570	1,500	1,730	1,730
Bahrain	1,620	1,600	1,620	1,620
Brazil	[e]1,100	1,200	1,280	1,280
Canada	3,320	3,300	3,310	3,310
China	44,000	45,000	44,600	45,000
Iceland	742	750	880	880
India	[e]4,200	4,200	4,200	4,200
Malaysia	[e]1,050	1,100	1,080	1,080
Norway	[e]1,300	1,300	1,460	1,460
Russia	3,880	3,900	4,080	4,080
United Arab Emirates	2,690	2,700	2,790	2,790
Other countries	6,680	7,000	10,500	11,000
World total (rounded)	72,800	74,000	78,800	79,700

World Resources:[11] Global resources of bauxite are estimated to be between 55 billion and 75 billion tons and are sufficient to meet world demand for aluminum metal well into the future.

Substitutes: Composites can substitute for aluminum in aircraft fuselages and wings. Glass, paper, plastics, and steel can substitute for aluminum in packaging. Composites, magnesium, steel, and titanium can substitute for aluminum in ground transportation uses. Composites, steel, vinyl, and wood can substitute for aluminum in construction. Copper can replace aluminum in electrical and heat-exchange applications.

[e]Estimated. NA Not available. — Zero.
[1]See also the Bauxite and Alumina chapter.
[2]Defined as primary production + secondary production from old scrap + imports – exports ± adjustments for stock changes; excludes traded scrap.
[3]These calculations no longer include exported scrap, because its return to the domestic supply cannot be reliably determined.
[4]Defined as primary production + secondary production + imports – exports ± adjustments for stock changes; excludes traded scrap.
[5]Source: S&P Global Platts Metals Week.
[6]Includes off-warrant stocks of primary and alloyed aluminum.
[7]Alumina and aluminum production workers (North American Industry Classification System—3313). Source: U.S. Department of Labor, Bureau of Labor Statistics.
[8]Defined as imports – exports ± adjustments for industry stock changes; excludes traded scrap.
[9]Includes Hong Kong.
[10]See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.
[11]See Appendix C for resource and reserve definitions and information concerning data sources.

ANTIMONY

(Data in metric tons, antimony content, unless otherwise specified)

Domestic Production and Use: In 2025, one domestic company began mining antimony in Montana. Primary antimony metal and oxide were produced by one company in Montana using imported feedstock. Secondary antimony production came from antimonial lead recovered from spent lead-acid batteries and was intended for the lead-acid battery industry. The estimated value of secondary antimony produced in 2025 was $190 million. Recycling supplied 12% of estimated domestic apparent consumption, and the remainder came from imports. In the United States, the leading uses of antimony were metal products, including flame retardants, 49%; antimonial lead and ammunition, 40%; and nonmetal products, including ceramics and glass and rubber products, 11%.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production:					
Mine (recoverable antimony)	—	—	—	—	W
Smelter:					
Primary	—	586	452	588	700
Secondary	4,050	4,100	3,490	3,330	3,500
Imports for consumption:					
Ore and concentrates	31	29	6	430	600
Oxide	19,100	17,000	14,000	24,000	39,000
Unwrought, powder	6,970	6,510	6,060	4,920	4,500
Antimony articles[1]	514	1,790	1,620	323	350
Waste and scrap[1]	13	71	3	13	200
Exports:					
Ore and concentrates[1]	9	53	24	—	5
Oxide	1,530	2,430	1,740	2,690	2,900
Unwrought, powder	824	1,230	1,510	1,570	240
Antimony articles[1]	97	585	433	125	130
Waste and scrap[1]	136	26	2	40	6
Consumption, apparent[2]	27,800	24,500	20,700	28,600	45,000
Price, metal, average, dollars per pound[3]	5.31	6.18	5.49	10.24	25
Net import reliance[4] as a percentage of apparent consumption	85	81	81	86	91

Recycling: The bulk of secondary antimony is recovered at secondary lead smelters as antimonial lead, most of which was generated by, and then consumed by, the lead-acid battery industry.

Import Sources (2021–2024): Ore and concentrates: Mexico, 86%; Italy, 9%; and other, 5%. Oxide: China, 66%; Belgium, 16%; Bolivia, 6%; France, 5%; and other, 7%. Unwrought metal and powder: China, 22%; India, 22%; Thailand, 20%; Vietnam, 13%; and other, 23%. Total metal and oxide: China, 55%; Belgium, 12%; Thailand, 8%; India, 6%; and other, 19%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Ore and concentrates	2617.10.0000	Free.
Antimony oxide	2825.80.0000	Free.
Unwrought antimony; powders	8110.10.0000	Free.
Waste and scrap	8110.20.0000	Free.
Antimony articles	8110.90.0000	Free.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile:[5]

	FY 2025		FY 2026	
Material	**Potential acquisitions**	**Potential disposals**	**Potential acquisitions**	**Potential disposals**
Antimony	700	—	NA	NA

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ANTIMONY

Events, Trends, and Issues: The average antimony price in 2025 was $25 per pound, more than double of that in 2024. In 2024, the average monthly antimony price nearly doubled from $9.8 per pound in August to $18.10 per pound in December after China announced export restrictions on antimony in August and then banned all exports of antimony to the United States in December. The prices increased an additional 52% to $27.50 per pound by June 2025 followed by a decrease to $20.30 per pound in November.

In October, a mining company in Idaho broke ground for construction of an antimony mine. The company was conditionally awarded $80 million of funding from the U.S. Department of War to reestablish a domestic source of antimony. According to the company, the project has total proven and probable mineral reserves of 14 million tons of antimony with an ore cutoff grade of 0.42% contained antimony. In November, another company announced that mining started at the Stibnite Hill Mine in Montana.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for China, Iran Kazakhstan, Kyrgyzstan, and Russia based on company, Government, or third-party reports. Reserves for Australia, China, and Tajikistan were revised based on Government reports.

	Mine production		Reserves[6]
	2024	2025[e]	
United States	—	W	[7]60,000
Australia	1,270	1,300	[8]110,000
Bolivia	5,300	5,000	310,000
Burma	[e]4,500	4,500	140,000
Canada	—	—	78,000
China	[e]40,000	40,000	830,000
Guatemala	[e]50	50	NA
Iran	[e]90	90	NA
Kazakhstan	[e]800	800	NA
Kyrgyzstan	[e]700	700	260,000
Laos	[e]200	200	NA
Mexico	600	600	18,000
Pakistan	260	260	26,000
Russia	[e]40,000	32,000	350,000
Tajikistan	[e]22,000	22,000	60,000
Turkey	[e]3,000	3,000	99,000
Vietnam	[e]220	220	54,000
World total (rounded)[9]	119,000	110,000	>2,000,000

World Resources:[6] U.S. resources of antimony are mainly in Alaska, Idaho, Montana, and Nevada. Principal identified world resources are in Australia, Bolivia, Burma, China, Mexico, Russia, South Africa, and Tajikistan. Additional antimony resources may occur in Mississippi Valley-type lead deposits in the Eastern United States.

Substitutes: Selected organic compounds and hydrated aluminum oxide are substitutes as flame retardants. Chromium, tin, titanium, zinc, and zirconium compounds substitute for antimony chemicals in enamels, paint, and pigments. Combinations of calcium, copper, selenium, sulfur, and tin are substitutes for alloys in lead-acid batteries.

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.
[1]Gross weight.
[2]Defined as primary production + secondary production from old scrap + imports of antimony in oxide and unwrought metal – exports of antimony in oxide and unwrought metal.
[3]Antimony minimum 99.65%, cost, insurance, and freight. Source: Argus Media group, Argus Non-Ferrous Markets.
[4]Defined as imports of antimony in oxide and unwrought metal, powder – exports of antimony in oxide and unwrought metal, powder.
[5]See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.
[6]See Appendix C for resource and reserve definitions and information concerning data sources.
[7]Company-reported probable reserves for the Stibnite Gold Project in Idaho.
[8]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 11,000 tons.
[9]In addition to the countries listed, antimony may have been produced in other countries, but available information was inadequate to make reliable estimates of output. Does not include production in the United States.

ARSENIC

(Data in metric tons, arsenic content,[1] unless otherwise specified)

Domestic Production and Use: Arsenic trioxide and primary arsenic metal have not been produced in the United States since 1985. The principal use for arsenic compounds was in herbicides and insecticides. Arsenic trioxide was predominantly used for the production of arsenic acid, which is a key ingredient in the production of chromated copper arsenate (CCA) preservatives. CCA preservatives are used for the pressure treating of lumber for primarily nonresidential applications such as light poles, marine applications, and retaining walls. Seven companies produced CCA-treated wood in the United States in 2025. High-purity (99.9999%) arsenic metal was used to produce gallium-arsenide (GaAs) semiconductors for solar cells, space research, and telecommunications; germanium-arsenide-selenide specialty optical materials; and indium-gallium-arsenide (InGaAs) for use in shortwave infrared technology. Arsenic metal was used as an antifriction additive for bearings, to harden lead shot and clip-on wheel weights, and to strengthen the grids in lead-acid storage batteries. The estimated value of arsenic compounds and metal imported domestically in 2025 was $8.4 million. Given that arsenic metal has not been produced domestically since 1985, it is likely that only a small portion of the material reported by the U.S. Census Bureau as arsenic exports was pure arsenic metal, and most of the material that was reported under this category reflects the gross weight of alloys, compounds, residues, scrap, and waste products containing arsenic. Therefore, the estimated consumption reported under U.S. salient statistics reflects only imports of arsenic products. Domestically, the leading use of arsenic was for the production of herbicides, insecticides, and wood preservatives (more than 80%), followed by metallurgical and semiconductor applications.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Imports for consumption:[2]					
Arsenic metal	835	896	612	533	740
Compounds	4,730	9,190	5,810	9,070	5,500
Total	5,560	10,100	6,430	9,610	6,300
Exports, arsenic metal[3]	31	82	34	138	51
Consumption, estimated, all forms of arsenic[4]	5,560	10,100	6,430	9,610	6,300
Price, metal, annual average, U.S. warehouse,[5] dollars per pound	1.11	1.82	2.05	1.97	1.85
Net import reliance[6] as a percentage of estimated consumption, all forms of arsenic	100	100	100	100	100

Recycling: Arsenic metal was contained in new scrap recycled during GaAs semiconductor manufacturing. Arsenic-containing process water was internally recycled at wood treatment plants where CCA was used. Although scrap electronic circuit boards, relays, and switches may contain arsenic, no arsenic was known to have been recovered during the recycling process to recover other contained metals. No arsenic was recovered domestically from arsenic-containing residues and dusts generated at nonferrous smelters in the United States.

Import Sources (2021–24):[2] Arsenic acid: Malaysia, 99%; and other, 1%. Arsenic metal: China, 95%; Japan, 3%; and other, 2%. Arsenic trioxide: China,[7] 61%; Morocco, 27%; Belgium, 6%; and other, 6%. All forms of arsenic: China,[7] 45%; Malaysia, 30%; Morocco, 16%; and other, 9%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Arsenic metal	2804.80.0000	Free.
Arsenic acid	2811.19.1000	2.3% ad valorem.
Arsenic trioxide	2811.29.1000	Free.
Arsenic trichloride	2812.19.0010	3.7% ad valorem.
Arsenic sulfide	2813.90.1000	Free.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

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ARSENIC

Events, Trends, and Issues: Peru, China, and Morocco, in descending order of production, continued to be the leading global producers of arsenic trioxide, accounting for more than 95% of estimated world production in 2025. China supplied more than 80% of United States imports of arsenic trioxide and more than 90% of arsenic metal imports through July 2025. Malaysia supplied almost all of the arsenic acid that was imported through July 2025.

High-purity arsenic metal was used to produce GaAs, indium-arsenide, and InGaAs semiconductors that were used in aerospace devices, biomedical devices, military applications, mobile devices, optoelectronic devices, photovoltaic applications, satellites, and wireless communications.

World Production and Capacity:

	Production[e, 8] (arsenic trioxide, gross weight)		Refinery capacity (arsenic trioxide, gross weight)[9]
	2024	2025	2025[e]
United States	—	—	—
Belgium	1,000	1,000	1,500
China	24,000	24,000	30,000
Japan	40	—	60
Morocco	6,000	5,000	8,000
Peru	31,000	30,000	37,000
Russia	500	500	4,000
World total (rounded)	62,500	61,000	81,000

World Resources:[10] Arsenic may be obtained from copper, gold, and lead smelter flue dust, as well as from roasting arsenopyrite, the most abundant ore mineral of arsenic. Arsenic has been recovered from orpiment and realgar in China, Peru, and the Philippines and from copper-gold ores in Chile, and arsenic is associated with gold occurrences in Canada. Orpiment and realgar from gold mines in Sichuan Province, China, were stockpiled for later recovery of arsenic. Arsenic also may be recovered from enargite, a copper mineral. Arsenic trioxide was produced at the hydrometallurgical complex of Guemassa, near Marrakech, Morocco, from cobalt-arsenide ore from the Bou Azzer Mine. World reserve data were unavailable but were estimated to be more than 20 times world production.

Substitutes: Substitutes for CCA in wood treatment include alkaline copper quaternary, ammoniacal copper quaternary, ammoniacal copper zinc arsenate, alkaline copper quaternary boron-based preservatives, copper azole, copper citrate, and copper naphthenate. Treated wood substitutes include concrete, plastic composite material, plasticized wood scrap, or steel. Silicon-based complementary metal-oxide semiconductor power amplifiers compete with GaAs power amplifiers in midtier third-generation cellular handsets. Many semiconductor manufacturers were moving away from GaAs- and silicon-based lateral diffused metal-oxide-semiconductor field-effect transistors to those using gallium nitride. Indium phosphide components can be substituted for GaAs-based infrared laser diodes in some specific-wavelength applications, and helium-neon lasers compete with GaAs in visible laser diode applications. Silicon is the principal competitor with GaAs in solar-cell applications. In many defense-related applications, GaAs-based integrated circuits are used because of their unique properties, and no effective substitutes exist for GaAs in these applications. In heterojunction bipolar transistors, GaAs is being replaced in some applications by silicon-germanium.

[e]Estimated. — Zero.
[1]Arsenic content of arsenic metal is 100%; arsenic content of arsenic compounds is 52.8% for arsenic acid, 60.7% for arsenic sulfide, 41.33% for arsenic trichloride, and 75.71% for arsenic trioxide.
[2]Arsenic content calculated from the reported gross weight of imports. See footnote 1 for content percentages of arsenic metal and compounds.
[3]May include alloys, compounds, and waste.
[4]Estimated to be the same as total imports.
[5]Minimum 99% arsenic. Source: Argus Media group, Argus Non-Ferrous Markets.
[6]Defined as imports.
[7]Includes Hong Kong.
[8]Includes calculated arsenic trioxide equivalent of output of elemental arsenic compounds other than arsenic trioxide; inclusion of such materials would not duplicate reported arsenic trioxide production. Chile and Mexico were estimated to be significant producers of commercial-grade arsenic trioxide but have reported no production in recent years.
[9]Yearend operation capacity.
[10]See Appendix C for resource and reserve definitions and information concerning data sources.

ASBESTOS

(Data in metric tons unless otherwise specified)

Domestic Production and Use: In 2025, U.S. consumption of unmanufactured asbestos fibers[1] was estimated to be 50 tons, a record low for the 20th and 21st centuries. All consumption was from stockpiles; the last asbestos mine in the United States closed in 2002, and imports of asbestos fibers were fully banned in May 2024. The chloralkali industry, which uses asbestos in nonreactive semipermeable diaphragms that prevent chlorine generated at the anode of an electrolytic cell from reacting with sodium hydroxide generated at the cathode, has accounted for 100% of domestic asbestos fiber consumption since no later than 2015. Most of the remaining chloralkali plants that use asbestos diaphragms will be required by the U.S. Environmental Protection Agency (EPA) to transition to alternative materials by 2029, with the remainder to follow by 2036. An unknown quantity of asbestos is consumed annually within imported manufactured products. As of yearend 2025, sheet gaskets were the only asbestos-containing articles permitted to be imported into the United States.[2] However, the expiration dates of domestic asbestos uses may be modified in the future as a result of legal proceedings in 2025.

Salient Statistics—United States:[3]	2021	2022	2023	2024	2025[e]
Imports for consumption[4]	41	224	—	—	—
Exports[5]	—	—	—	—	—
Consumption, estimated[6]	310	290	150	115	50
Price, average U.S. customs unit value of imports, dollars per ton	1,880	2,630	NA	NA	NA
Net import reliance[7] as a percentage of estimated consumption	100	100	100	100	100

Recycling: None.

Import Sources (2021–24): Brazil, 100%. The U.S. Census Bureau reported imports from China, Germany, and Poland during this time period, but bill of lading information, data reported by the Government of China, and asbestos bans in Germany and Poland suggest that these shipments were misclassified.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Crocidolite	2524.10.0000	Free.
Amosite	2524.90.0010	Free.
Chrysotile:		
Crudes	2524.90.0030	Free.
Milled fibers, group 3 grades	2524.90.0040	Free.
Milled fibers, group 4 and 5 grades	2524.90.0045	Free.
Other	2524.90.0055	Free.
Other, asbestos	2524.90.0060	Free.

Depletion Allowance: 22% (domestic), 10% (foreign).

Government Stockpile: None.

Events, Trends, and Issues: In the United States, consumption of unmanufactured asbestos fibers decreased significantly during the past several decades, from a record high of 803,000 tons in 1973 to 500 tons or less in each year since 2018. Health and liability issues associated with asbestos use resulted in the displacement of asbestos from traditional markets by alternative materials and new technology. Domestic consumption was expected to decrease to zero by no later than 2036, when all chloralkali plants will be required by the EPA to stop using asbestos diaphragms in the production process for chlorine and sodium hydroxide. The final permitted application of asbestos within imported manufactured products—sheet gaskets used in the disposal of nuclear materials—will be fully banned by yearend 2037.[2] However, the expiration dates of asbestos applications in the United States may be modified in the future as a result of legal proceedings in 2025.

In Brazil, the State of Goias passed a law in August 2024 that set a 5-year deadline for the suspension of asbestos mining and processing activities. The deadline period will begin once the only producer of asbestos in Brazil reaches an agreement with the State on a mine closure plan. No agreement was in place as of September 30, 2025. In February 2023, the Supreme Federal Court of Brazil upheld a 2017 ruling that the extraction, sale, and use of asbestos were unconstitutional.

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ASBESTOS

Worldwide consumption of unmanufactured asbestos fibers was an estimated 930,000 tons in 2025, a decrease of nearly 55% from approximately 2 million tons in 2000. Global demand for asbestos products was expected to continue for the foreseeable future, particularly for cement pipe, roofing sheets, and other construction materials in Asia.

World Mine Production and Reserves: In addition to the countries listed, Zimbabwe may have produced asbestos from old mine tailings; the status of these operations was unknown. Significant revisions were made to the 2024 production for some countries based on company and Government reports. Reserves for China, Kazakhstan, and the United States were revised based on company and Government reports.

	Mine production		Reserves[8]
	2024	2025[e]	
United States	—	—	—
Brazil	[9]166,890	150,000	11,000,000
China	[e]250,000	250,000	7,100,000
Kazakhstan	225,700	250,000	20,000,000
Russia	306,900	310,000	110,000,000
World total (rounded)	949,000	960,000	150,000,000

World Resources:[8] Reliable evaluations of global asbestos resources have not been published recently, and available information was insufficient to make accurate estimates for most countries. However, world resources are large and more than adequate to meet anticipated demand in the foreseeable future. Resources in the United States are composed mostly of short-fiber asbestos for which use in asbestos-based products is more limited than long-fiber asbestos.

Substitutes: Numerous materials substitute for asbestos, including calcium silicate, carbon fibers, cellulose fibers, ceramic fibers, glass fibers, steel fibers, wollastonite, and several organic fibers such as aramid, polyethylene, polypropylene, and polytetrafluoroethylene. Several nonfibrous minerals or rocks, such as perlite, serpentine, silica, and talc, are also considered to be possible asbestos substitutes for products in which the reinforcement properties of fibers are not required. Membrane cells and mercury cells are alternatives to asbestos diaphragms used in the chloralkali industry.

[e]Estimated. NA Not available. — Zero.
[1]Refers to a group of silicate minerals that consist of bundles of separable fibers with high length-to-width ratios. The six asbestos minerals with a history of use in commercial products are actinolite, amosite, anthophyllite, chrysotile, crocidolite, and tremolite. Chrysotile has been the only type of asbestos with significant commercial use in the 21st century.
[2]Source: U.S. Environmental Protection Agency, 2024, Asbestos part 1; Chrysotile asbestos; Regulation of certain conditions of use under the Toxic Substances Control Act (TSCA): Federal Register, v. 89, no. 61, March 28, p. 21970–22010. (Accessed September 19, 2025, at https://www.govinfo.gov/content/pkg/FR-2024-03-28/pdf/2024-05972.pdf.)
[3]Includes unmanufactured asbestos fibers (chrysotile) only; excludes asbestos contained in manufactured products.
[4]Modified from reported U.S. Census Bureau data. Additional imports from China were reported in 2021 (59 tons) and 2022 (99 tons), but bill of lading information and data reported by the Government of China suggest that these shipments were misclassified. The U.S. Census Bureau also reported imports of 2 tons from Poland in 2023, 4 tons from Germany in 2024, and 20 tons from Germany through July 2025, but asbestos bans in these countries and in the United States since May 2024 suggest that these shipments were misclassified.
[5]Nonzero exports were reported by the U.S. Census Bureau in each year from 2021 through 2025, but these shipments likely consisted of materials misclassified as asbestos, reexports, and (or) waste products because asbestos has not been mined in the United States since 2002.
[6]Estimated as a 5-year rolling average of imports for consumption. Information regarding the quantity of industry stocks was unavailable.
[7]Defined as imports – exports ± adjustments for industry stock changes. All consumption was from imports and unreported stockpiles.
[8]See Appendix C for resource and reserve definitions and information concerning data sources.
[9]Export sales reported by the only producer of asbestos in Brazil.

BARITE

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: In 2025, three companies mined barite at four operations in Nevada. Mine production increased, but data were withheld to avoid disclosing company proprietary data. An estimated 2.3 million tons of barite (from domestic production and imports) was sold by companies that operated crushers and grinders in nine States.

Typically, more than 90% of the barite sold in the United States is used as a weighting agent in fluids used in the drilling of oil and natural gas wells. The majority of Nevada crude barite was ground in Nevada and then sold to companies drilling in the Central and Western United States. Because of the higher cost of rail and truck transportation compared with ocean freight, offshore and onshore drilling operations in other regions primarily used imported barite.

Barite also is used as a filler, extender, or weighting agent in products such as paints, plastics, and rubber. Some specific applications include use in automobile brake and clutch pads, in automobile paint primer for metal protection and gloss, as a weighting agent in rubber, and in the cement jacket around underwater petroleum pipelines. In the metal-casting industry, barite is part of the mold-release compounds. Because barite significantly blocks X-ray and gamma-ray emissions, it is used as aggregate in high-density concrete for radiation shielding around X-ray units in hospitals, nuclear powerplants, and university nuclear research facilities. Ultrapure barite is used as a contrast medium in X-ray and computed tomography examinations of the gastrointestinal tract.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production:					
Sold or used, mine	W	W	W	W	W
Ground and crushed[1]	1,670	2,220	2,260	2,280	2,300
Imports:[2]					
For consumption	1,660	2,330	2,420	1,880	2,300
General	1,440	1,890	2,220	1,810	1,700
Exports[3]	62	87	75	65	67
Consumption, apparent (crude and ground)[4]	W	W	W	W	W
Price, average unit value, ground, ex-works, dollars per metric ton	167	145	218	210	210
Employment, mine and mill, number[e]	330	380	440	400	400
Net import reliance[5] as a percentage of apparent consumption	>75	>75	>75	>75	>75

Recycling: None.

Import Sources (2021–24): India, 39%; China,[6] 21%; Morocco, 19%; Mexico, 14%; and other, 7%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Ground barite	2511.10.1000	Free.
Crude barite	2511.10.5000	$1.25 per metric ton.
Barium compounds:		
Barium oxide, hydroxide, and peroxide	2816.40.2000	2% ad valorem.
Barium chloride	2827.39.4500	4.2% ad valorem.
Barium sulfate, precipitated	2833.27.0000	0.6% ad valorem.
Barium carbonate, precipitated	2836.60.0000	2.3% ad valorem.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

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BARITE

Events, Trends, and Issues: Rig counts for oil and gas production are often used as an indicator of barite consumption. However, barite use per rig has been increasing owing to deeper oil and gas wells that require fewer rigs for oil and gas production. Through October 2025, the world annual average rig count[7] excluding the United States was 1,258 compared with 1,349 through the same period in 2024 and the domestic average rig count[7] was 564 compared with 599 through the same period in 2024. Despite the decrease in global and domestic drill rig counts, barite sales were estimated to have increased. A company in Kazakhstan announced that it planned to start mining barite in Qaraghandy Province.

World Mine Production and Reserves: In response to concerns about dwindling global reserves of 4.2-specific-gravity barite used by the oil- and gas-drilling industry, the American Petroleum Institute issued an alternate specification for 4.1-specific-gravity weighting agents in 2010. Estimated reserves data were included only if developed since the adoption of the 4.1-specific-gravity standard. Reserves for China were revised based on company and Government reports.

	Mine production[e]		Reserves[8]
	2024	2025	
United States	W	W	NA
China	2,100	2,200	120,000
India	2,600	3,000	51,000
Iran	300	300	100,000
Kazakhstan	650	700	85,000
Laos	250	260	NA
Mexico	[9]244	300	NA
Morocco	930	1,000	NA
Pakistan	[9]94	100	NA
Russia	200	230	12,000
Turkey	[9]261	260	34,000
Other countries	340	350	NA
World total (rounded)	[10]8,000	[10]8,700	NA

World Resources:[8] In the United States, identified resources of barite were estimated to be 150 million tons, and undiscovered resources contributed an additional 150 million tons. The world's barite resources in all categories were about 2 billion tons, but only about 740 million tons were identified resources.

Substitutes: Owing to technical and economic factors, there are no large-scale alternatives to barite in oil- and gas-drilling fluids. Calcium carbonate, hematite, ilmenite, and manganese tetroxide are the most common alternatives used in specific circumstances. Some technical literature and patents also mention use of celestite, iron carbonate, and strontium carbonate, but these are not estimated to be widely used.

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data.
[1]Imported and domestic barite, crushed and ground, sold or used by domestic grinding establishments.
[2]Includes data for the following Harmonized Tariff Schedule of the United States codes: 2511.10.1000, 2511.10.5000, and 2833.27.0000. General imports and imports for consumption data differ because of barite processed in free trade zones. General import data reports the form of imported barite at the time it entered the United States, whereas imports for consumption data reports crude barite processed in free trade zones as ground. Imports for consumption may not be immediately reported depending on processing time.
[3]Includes data for the following Schedule B numbers: 2511.10.1000 and 2833.27.0000.
[4]Defined as mine production (sold or used) + imports for consumption – exports.
[5]Defined as imports for consumption – exports.
[6]Includes Hong Kong.
[7]Source: Baker Hughes Co., 2025, Worldwide Rig Count: Baker Hughes Co. (Accessed November 14, 2025, at https://bakerhughesrigcount.gcs-web.com/intl-rig-count.)
[8]See Appendix C for resource and reserve definitions and information concerning data sources.
[9]Reported.
[10]Excludes U.S. production.

BAUXITE AND ALUMINA[1]

(Data in thousand metric dry tons unless otherwise specified)

Domestic Production and Use: In 2025, a limited amount of bauxite and bauxitic clay was produced for nonmetallurgical use in Alabama, Arkansas, and Georgia. Production statistics were withheld for bauxite and estimated for alumina to avoid disclosing company proprietary data. In 2025, the reported quantity of bauxite consumed was estimated to be 1.7 million tons, 4% more than that reported in 2024, with an estimated value of $54 million. An estimated 63% of the bauxite consumed was refined by the Bayer process for alumina or aluminum hydroxide, and the remainder went to products such as abrasives, cement, chemicals, proppants, and refractories, and as a slag adjuster in steel mills. Alumina production was estimated to be 710,000 tons, slightly more than that in 2024. About 70% of the alumina produced went to primary aluminum smelters, and the remainder went to nonmetallurgical products, such as abrasives, ceramics, chemicals, and refractories.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Bauxite:					
Production, mine	W	W	W	W	W
Imports for consumption[2]	3,880	3,630	3,160	2,920	3,000
Exports[2]	13	10	14	18	74
Stocks, industry, yearend[e, 2]	200	200	240	250	240
Consumption:					
Apparent[3]	W	W	W	W	W
Reported	2,790	2,170	2,050	1,640	1,700
Price, average unit value of imports, free alongside ship (f.a.s.), dollars per metric ton	31	32	31	31	32
Net import reliance[4] as a percentage of apparent consumption	>75	>75	>75	>75	>75
Alumina:					
Production, refinery[e, 5]	1,000	920	850	700	710
Imports for consumption[5]	1,550	1,880	1,360	1,340	1,900
Exports[5]	180	174	139	145	130
Stocks, industry, yearend[5]	202	194	190	184	200
Consumption, apparent[3]	2,410	2,640	2,080	1,900	2,500
Price, average unit value of imports, f.a.s., dollars per metric ton	462	518	481	580	590
Net import reliance[4] as a percentage of apparent consumption	58	65	59	63	71

Recycling: None.

Import Sources (2021–24): Bauxite:[2] Jamaica, 60%; Turkey, 16%; Guyana, 9%; Australia, 8%; and other, 7%. Alumina:[5] Brazil, 71%; Jamaica, 7%; Australia, 6%; Canada, 5%; and other, 11%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Bauxite, calcined (refractory grade)	2606.00.0030	Free.
Bauxite, calcined (other)	2606.00.0060	Free.
Bauxite, crude dry (metallurgical grade)	2606.00.0090	Free.
Aluminum oxide (alumina)	2818.20.0000	Free.
Aluminum hydroxide	2818.30.0000	Free.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile: None.

Events, Trends, and Issues: In 2025, one domestic alumina refinery produced alumina from imported bauxite. A 1.2-million-ton-per-year alumina refinery in Gramercy, LA, produced alumina for aluminum smelting and specialty-grade alumina. A 500,000-ton-per-year alumina refinery in Burnside, LA, was temporarily shut down in August 2020 and remained idle in 2025. No plans were announced regarding its reopening. The average prices, f.a.s., for U.S. imports for consumption of crude dry bauxite and metallurgical-grade alumina during the first 8 months of 2025 were $31 per ton and $595 per ton, respectively, 4% and 9% more than those in the same period in 2024.

In January, an Austrian multinational aluminum refractories producer acquired full control of a United States manufacturer of monolithic alumina refractories serving the aluminum, cement, petrochemical, and steel industries. In April, a 1-million-ton-per-year alumina refinery in Mempawah, Indonesia, shipped its first alumina to an aluminum smelter in North Sumatra, Indonesia. The additional capacity may support an increase in bauxite production, which

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BAUXITE AND ALUMINA

declined sharply following Indonesia's 2023 ban on bauxite exports. Mining began in June within expanded boundaries at a bauxite mine near Boddington, Australia, to supply feedstock to a 4.7-million-ton-per-year alumina refinery near Collie, Australia. In August, the Guinean Government, following a dispute over the construction of an alumina refinery, revoked bauxite mining licenses from a subsidiary of a United Arab Emirates-based aluminum producer and reallocated the concessions to a state-backed mining company.

World Alumina Refinery and Bauxite Mine Production and Bauxite Reserves: Significant revisions were made to the 2024 production of alumina for Germany and of bauxite for Greece and Indonesia based on company and Government reports. Reserves for Australia, Brazil, China, Indonesia, Kazakhstan, and Russia were revised based on company and Government reports.

	Alumina production[5]		Bauxite production		Bauxite reserves[6]
	2024	2025[e]	2024	2025[e]	
United States	[e]700	710	W	W	20,000
Australia	17,100	17,000	100,000	97,000	[7]3,700,000
Brazil	[e]10,600	11,000	[e]33,000	33,000	1,700,000
Canada	1,460	1,500	—	—	—
China	85,500	93,000	[e]80,500	87,000	710,000
Germany	[e]450	460	—	—	—
Greece	865	850	[e]970	960	—
Guinea	351	360	142,000	150,000	7,400,000
India	[e]8,000	8,200	25,000	25,000	650,000
Indonesia	[e]1,200	1,500	[e]9,900	10,000	2,900,000
Ireland	1,720	1,700	—	—	—
Jamaica	1,480	1,500	5,890	6,200	2,000,000
Kazakhstan	[e]1,400	1,500	4,780	4,800	160,000
Russia	2,840	2,900	5,470	5,700	650,000
Saudi Arabia	1,870	1,900	[e]5,500	5,700	180,000
Spain	[e]800	810	—	—	—
Turkey	[e]300	310	3,660	3,800	69,000
United Arab Emirates	2,540	2,300	—	—	—
Vietnam	1,410	1,500	[e]3,710	3,800	3,100,000
Other countries	1,260	1,300	7,780	8,000	5,300,000
World total (rounded)	142,000	150,000	[8]428,000	[8]440,000	29,000,000

World Resources:[6] Bauxite resources are estimated to range from 55 billion to 75 billion tons, distributed in Africa (32%), Oceania (23%), South America and the Caribbean (21%), Asia (18%), and elsewhere (6%). Domestic resources of bauxite are inadequate to meet long-term U.S. demand, but the United States and most other major aluminum-producing countries have essentially inexhaustible subeconomic resources of aluminum in materials other than bauxite.

Substitutes: Bauxite is the only raw material used in the production of alumina on a commercial scale in the United States. Although currently not economically competitive with bauxite, vast resources of clay are technically feasible sources of alumina. Other raw materials, such as alunite, anorthosite, coal wastes, and oil shales, offer additional potential alumina sources. Synthetic mullite, produced from kaolin, bauxitic kaolin, kyanite, and sillimanite, substitutes for bauxite-based refractories. Silicon carbide and alumina zirconia can substitute for alumina and bauxite in abrasives but cost more.

[e]Estimated. W Withheld to avoid disclosing company proprietary data. — Zero.
[1]See also the Aluminum chapter. As a general rule, 4 tons of dried bauxite is required to produce 2 tons of alumina, which, in turn, can be used to produce 1 ton of aluminum.
[2]Includes all forms of bauxite, expressed as dry equivalent weights.
[3]Defined as production + imports – exports ± adjustments for industry stock changes.
[4]Defined as imports – exports ± adjustments for industry stock changes.
[5]Calcined equivalent weights.
[6]See Appendix C for resource and reserve definitions and information concerning data sources.
[7]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 1.7 billion tons.
[8]Excludes U.S. production.

BERYLLIUM

(Data in metric tons, beryllium content, unless otherwise specified)

Domestic Production and Use: One company in Utah mined bertrandite ore and converted it, along with imported beryl, into beryllium hydroxide. Some of the beryllium hydroxide was shipped to the company's plant in Ohio, where it was converted into metal, oxide, and downstream beryllium-copper master alloy, and some was sold. Estimated beryllium apparent consumption in 2025 was 230 tons and was valued at about $360 million based on the most recent beryllium price estimate. Based on sales revenues, approximately 29% of beryllium products were used in consumer electronics, 24% in aerospace and defense applications, 17% in industrial components, 9% in automotive electronics, 8% in energy applications, 2% in semiconductor applications, and 11% in other applications. Beryllium alloy strip and bulk products, the most common forms of processed beryllium, were used in all application areas. Most unalloyed beryllium metal and beryllium composite products were used in defense and scientific applications. The U.S. Department of War supports the availability of domestic beryllium to meet critical defense needs. In 2010, under the Defense Production Act, Title III, a public-private partnership with the leading U.S. beryllium producer reestablished domestic production of beryllium metal.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production, mine shipments	175	175	185	230	230
Imports for consumption[1]	49	39	25	16	10
Exports[2]	30	59	68	26	15
Shipments from Government stockpile[3]	7	9	NA	NA	NA
Consumption:					
Apparent[4]	196	189	142	220	230
Reported, ore	170	170	180	180	180
Price, annual average unit value, beryllium-copper master alloy,[5] dollars per kilogram of contained beryllium	680	660	1,400	1,500	1,600
Stocks, ore, industry, yearend	35	10	10	10	10
Net import reliance[6] as a percentage of apparent consumption	11	7	E	E	E

Recycling: Beryllium was recovered from new scrap generated during the manufacture of beryllium products and from old scrap. Detailed data on the quantities of beryllium recycled were not available but may account for as much as 20% to 25% of total beryllium consumption. The leading U.S. beryllium producer managed a recycling program for all its beryllium products, recovering approximately 40% of the beryllium content of the new and old beryllium alloy scrap.

Import Sources (2021–24):[1] Kazakhstan, 31%; Latvia, 25%; Japan, 19%; Germany, 5%; and other, 20%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Beryllium ores and concentrates	2617.90.0030	Free.
Beryllium oxide and hydroxide	2825.90.1000	3.7% ad valorem.
Beryllium-copper master alloy	7405.00.6030	Free.
Beryllium-copper plates, sheets, and strip:		
Thickness of 5 millimeters (mm) or more	7409.90.1030	3% ad valorem.
Thickness of less than 5 mm:		
Width of 500 mm or more	7409.90.5030	1.7% ad valorem.
Width of less than 500 mm	7409.90.9030	3% ad valorem.
Beryllium:		
Unwrought, including powders	8112.12.0000	8.5% ad valorem.
Waste and scrap	8112.13.0000	Free.
Other	8112.19.0000	5.5% ad valorem.

Depletion Allowance: 22% (domestic), 14% (foreign).

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BERYLLIUM

Government Stockpile:[7]

Material	FY 2025 Potential acquisitions	FY 2025 Potential disposals	FY 2026 Potential acquisitions	FY 2026 Potential disposals
Metal (all types)	—	7	NA	NA

Events, Trends, and Issues: Apparent consumption in 2025 increased by 2% from that in 2024 owing primarily to a 43% decrease in estimated beryllium exports, offset by a 34% decrease in estimated imports. The decrease in exports reflected a large reduction in beryllium metal exports to Canada, China, France, and Germany. The decrease in imports reflected a reduction in beryllium metal imports from Germany, Kazakhstan, and Latvia. During the first 6 months of 2025, the leading U.S. beryllium producer reported that net sales of its beryllium alloy strip and bulk products and beryllium metal and composite products were about the same as those during the first 6 months of 2024. Net sales of beryllium products decreased primarily in the automotive electronics, consumer electronics, and life sciences end markets. Because of the toxic nature of beryllium, various international, national, and State guidelines and regulations have been established regarding beryllium in air, water, and other media. Industry is required to carefully control the quantity of beryllium dust, fumes, and mists in the workplace.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Mozambique, Nigeria, and the United States based on company and Government reports.

	Mine production[8, 9] 2024	Mine production[8, 9] 2025[e]	Reserves[10]
United States	230	230	The United States has very little beryl that can be economically hand sorted from pegmatite deposits. An epithermal deposit in the Spor Mountain area in Utah is a large bertrandite resource, which is being mined. Proven and probable bertrandite reserves in Utah total about 19,000 tons of beryllium content. World beryllium reserves were not available.
Brazil	[e]80	80	
China	[e]78	77	
Madagascar	[e]1	1	
Mozambique	3	3	
Nigeria	[e]40	40	
Rwanda	[e]1	1	
World total (rounded)	433	430	

World Resources:[10] The world's identified resources of beryllium have been estimated to be more than 100,000 tons. About 60% of these resources are in the United States; by tonnage, the Spor Mountain area in Utah, the McCullough Butte area in Nevada, the Black Hills area in South Dakota, the Sierra Blanca area in Texas, the Seward Peninsula in Alaska, and the Gold Hill area in Utah account for most of the total.

Substitutes: Because the cost of beryllium is high compared with that of other materials, it is used in applications in which its properties are crucial. In some applications, certain metal matrix or organic composites, high-strength grades of aluminum, pyrolytic graphite, silicon carbide, steel, or titanium may be substituted for beryllium metal or beryllium composites. Copper alloys containing nickel and silicon, tin, titanium, or other alloying elements or phosphor bronze alloys (copper-tin-phosphorus) may be substituted for beryllium-copper alloys, but these substitutions can result in substantially reduced performance. Aluminum nitride or boron nitride may be substituted for beryllium oxide.

[e]Estimated. E Net exporter. NA Not available. — Zero.

[1]Includes estimated beryllium content of imported ores and concentrates, oxide and hydroxide, unwrought metal (including powders), beryllium articles, waste and scrap, beryllium-copper master alloy, and beryllium-copper plates, sheets, and strip.

[2]Includes estimated beryllium content of exported unwrought metal (including powders), beryllium articles, and waste and scrap.

[3]Change in total inventory from prior yearend inventory. Negative values indicate increase in inventory. Beginning in 2023, Government stock changes are no longer available.

[4]Defined for 2020–22 as production + imports − exports ± adjustments for Government and industry stock changes. Beginning in 2023, Government stock changes no longer included.

[5]Calculated from gross weight and customs value of imports; beryllium content estimated to be 4%. Rounded to two significant figures.

[6]Defined for 2020–22 as imports − exports ± adjustments for Government and industry stock changes. Beginning in 2023, Government stock changes no longer included.

[7]See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.

[8]In addition to the countries listed, Kazakhstan and Portugal may have produced beryl ore, but available information was inadequate to make reliable estimates of output. Other nations that produced gemstone beryl ore may also have produced some industrial beryl ore.

[9]Based on 4% beryllium content of bertrandite and beryl sources.

[10]See Appendix C for resource and reserve definitions and information concerning data sources.

BISMUTH

(Data in metric tons unless otherwise specified)

Domestic Production and Use: The United States ceased production of primary refined bismuth in 1997 and is highly import reliant. Bismuth is contained in some lead ores mined domestically. However, the last domestic primary lead smelter closed at yearend 2013; since then, all lead concentrates have been exported for smelting.

Most domestic bismuth consumption was for chemicals used in cosmetic, industrial, laboratory, and pharmaceutical applications. Bismuth use in pharmaceuticals included bismuth subsalicylate (the active ingredient in over-the-counter stomach remedies) and other compounds used to treat burns, intestinal disorders, and stomach ulcers. Bismuth compounds such as bismuth nitrate, bismuth oxychloride, and bismuth vanadate are also used in industrial applications for the manufacture of ceramic glazes, crystalware, high-performance pigments, and pearlescent pigments.

Bismuth has a wide variety of metallurgical applications, including use as an additive to improve metal integrity of malleable cast iron in the foundry industry and as a nontoxic replacement for lead in brass, free-machining aluminum alloys and steels, and solders. The use of bismuth in brass for pipe fittings, fixtures, and water meters increased after 2014, when the definition of “lead-free” under the Safe Drinking Water Act was modified to reduce the maximum lead content of “lead-free” pipes and plumbing fixtures to 0.25% from 8%. The melting point of bismuth is relatively low at 271 degrees Celsius. Bismuth is an important component of various fusible alloys that can be used in holding devices for grinding optical lenses, as plugs for abandoned oil wells, as a temporary filler to prevent damage to tubes in bending operations, as a triggering mechanism for fire sprinklers, and in other applications in which a low melting point is ideal. Bismuth-tellurium-oxide alloy film paste is used in the manufacture of semiconductor devices.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production:					
Refinery	—	—	—	—	—
Secondary (scrap)[e]	80	80	80	80	80
Imports for consumption, metal, alloys, and scrap:					
Containing more than 99.99% bismuth, by weight	NA	740	731	626	650
Other	NA	2,340	1,110	1,180	820
Total[1]	1,980	3,080	1,840	1,800	1,500
Exports, metal, alloys, and scrap:					
Containing more than 99.99% bismuth, by weight	NA	144	131	430	180
Other	NA	360	329	620	360
Total[2]	1,010	503	460	1,050	540
Consumption:					
Apparent[3]	1,030	2,600	1,450	830	1,000
Reported	597	724	691	700	NA
Price, average,[4] dollars per pound	3.74	3.90	4.08	5.40	20
Stocks, yearend, consumer, bismuth metal	297	356	365	365	360
Net import reliance[5] as a percentage of apparent consumption	92	97	94	90	92

Recycling: Recycled bismuth-containing alloy scrap was estimated to compose up to 10% of U.S. bismuth apparent consumption for the years 2021–25.

Import Sources (2021–24): China,[6] 56%; Republic of Korea, 22%; Germany, 13%; and other, 9%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Bismuth and articles thereof, including waste and scrap:		
Containing more than 99.99% of bismuth, by weight	8106.10.0000	Free.
Other	8106.90.0000	Free.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile: None.

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BISMUTH

<u>Events, Trends, and Issues</u>: In 2025, average monthly prices for bismuth (in-warehouse, Rotterdam) increased from $5.96 per pound in January to $17.50 per pound in October. The highest monthly average price was $34.22 per pound in March, owing to China issuing export controls on bismuth in response to the United States imposing 10% import tariffs on Chinese goods in February. The estimated annual average price in 2025 was $20 per pound, almost four times the price in 2024 and the highest annual average price on record. United States bismuth metal imports (under Harmonized System code 8106) from China decreased by 40% to an estimated 460 tons for the full year of 2025 from 760 tons in 2024.

Estimated world production of bismuth was 16,000 tons in 2025. China accounted for 88% of the bismuth world production in 2025. Reported bismuth production capacities were unavailable.

<u>World Refinery Production and Capacity</u>: Significant revisions were made to the 2024 production for Bolivia and Laos based on company and Government reports.

	Refinery production[e]		Production capacity
	2024	2025	
United States	—	—	NA
Bolivia	50	50	NA
Bulgaria	48	50	NA
China	14,000	14,000	NA
Japan	500	500	NA
Kazakhstan	180	180	NA
Korea, Republic of	1,000	1,000	NA
Laos	[7]492	500	NA
World total (rounded)	16,300	16,000	NA

<u>World Resources</u>:[8] Bismuth reserves and resources data were generally not reported at a mine or country level and thus difficult to quantify. Bismuth minerals rarely occur in sufficient quantities to be mined as principal products; bismuth is produced most often as a byproduct during the processing of lead ores. In China and Vietnam, bismuth is also produced as a byproduct or coproduct of tungsten and other metal ore processing. In Japan and the Republic of Korea, bismuth is produced as a byproduct or coproduct of zinc ore processing. The Tasna Mine in Bolivia, which has been inactive since 1996, and a mine in China are the only mines where bismuth has been the primary product.

<u>Substitutes</u>: Bismuth compounds can be replaced in pharmaceutical applications by alumina, antibiotics, calcium carbonate, and magnesia. Titanium-dioxide-coated mica flakes and fish-scale extracts are substitutes in certain pigment uses. Cadmium, indium, lead, and tin can partially replace bismuth in low-temperature solders. Resins can replace bismuth alloys for holding metal shapes during machining, and glycerin-filled glass bulbs can replace bismuth alloys in triggering devices for fire sprinklers. Free-machining alloys can contain lead, selenium, or tellurium as a replacement for bismuth. Bismuth is a nontoxic substitute for lead in plumbing and many other applications, including fishing weights, hunting ammunition, lubricating greases, and soldering alloys.

[e]Estimated. NA Not available. — Zero.

[1]Includes data for the following Harmonized Tariff Schedule of the United States codes: 8106.00.0000 (for the year 2021), and 8106.10.0000 and 8106.90.0000 (for the years 2022–25).

[2]Includes data for the following Schedule B numbers: 8106.00.0000 (for the year 2021), and 8106.10.0000 and 8106.90.0000 (for the years 2022–25).

[3]Defined as secondary production + imports – exports ± adjustments for industry stock changes.

[4]Prices are based on data available through October 2025 of 99.99%-purity metal at warehouse (Rotterdam) in minimum lots of 1 ton. Source: Fastmarkets.

[5]Defined as imports – exports ± adjustments for industry stock changes.

[6]Includes Hong Kong.

[7]Reported.

[8]See Appendix C for resource and reserve definitions and information concerning data sources.

BORON

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: Three companies in southern California produced borates in 2025, and most of the boron products consumed in the United States were manufactured domestically. Estimated boron production was essentially the same in 2025 compared with production in 2024. U.S. boron production and consumption data were withheld to avoid disclosing company proprietary data. The leading boron producer mined borate ores, which contain the minerals kernite, tincal, and ulexite, by open pit methods and operated associated compound plants. Kernite was used to produce boric acid, tincal was used to produce sodium borate, and ulexite was used as a primary ingredient in the manufacture of a variety of specialty glasses and ceramics. Two companies produced borates from brines extracted through solution-mining techniques. Boron minerals and chemicals were principally consumed in the north-central and eastern United States. In 2025, the glass and ceramics industries remained the leading domestic users of boron products. Boron also was used as a component in abrasives, cleaning products, insecticides, insulation, and in the production of semiconductors.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production	W	W	W	W	W
Imports for consumption:					
Refined borax	232	168	156	150	120
Boric acid	54	48	38	43	45
Colemanite (calcium borates)	3	1	2	1	2
Ulexite (sodium borates)	49	38	20	28	38
Exports:					
Boric acid	280	239	253	246	260
Refined borax	607	651	604	655	600
Consumption, apparent[1]	W	W	W	W	W
Price, average unit value of combined imports, cost, insurance, and freight, dollars per metric ton	394	485	606	574	540
Employment, number[e]	1,330	1,400	1,430	1,500	1,500
Net import reliance[2] as a percentage of apparent consumption	E	E	E	E	E

Recycling: Insignificant.

Import Sources (2021–24): All forms: Turkey, 90%; Bolivia, 6%; and other, 4%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Natural borates:		
Sodium (ulexite)	2528.00.0005	Free.
Calcium (colemanite)	2528.00.0010	Free.
Boric acids	2810.00.0000	1.5% ad valorem.
Borates, refined borax:		
Anhydrous	2840.11.0000	0.3% ad valorem.
Non-anhydrous	2840.19.0000	0.1% ad valorem.

Depletion Allowance: Borax, 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Elemental boron is a metalloid with limited commercial applications. Although the term “boron” is commonly referenced, it does not occur in nature in an elemental state. Boron combines with oxygen and other elements to form boric acid or inorganic salts called borates. Boron compounds, chiefly borates, are commercially important; therefore, boron products are priced and sold based on their boric oxide (B_2O_3) content, varying by ore and compound and by the absence or presence of calcium and sodium. Four borate minerals—colemanite, kernite, tincal, and ulexite—account for 90% of the borate minerals used by industry worldwide. Although borates were used in more than 300 applications, more than three-quarters of world consumption was used in ceramics, detergents, fertilizers, and glass.

China, India, Malaysia, Indonesia, the Netherlands, and Canada, in decreasing order of tonnage, were the countries that imported the largest quantities of refined borates from the United States in 2025. Domestic shipments of boric acid were sent to China, the Netherlands, the Republic of Korea, Taiwan, and Japan, in decreasing order of tonnage.

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BORON

Because China has low-grade boron reserves and demand for boron is anticipated to rise in that country, imports from the United States were expected to remain steady during the next several years.

Interests and investments in boron derivatives continued abroad and domestically. In May 2025, a boron project in Piskanja, Serbia, owned by a Canada-based mine developer signed a letter of intent with a Serbian mining company to renovate the Pobrdje Mine, extend its mine life, and to repurpose regional mining equipment. The Pobrdje Mine's deposit consisted primarily of colemanite and the mine was estimated to have a mine life of 21 years. A geologic exploration of the Jarandol Basin, Serbia, was also completed in May and confirmed boron mineralization. In June, the European Commission designated the Jadar project, developed by a London-based global mining company, as one of the 60 strategic projects for the Critical Raw Materials Act. The Jadar Project was endorsed for investment in the extraction of boron and lithium to help the European Union ensure that it maintains diverse, stable, and secure supply chains. The project is in western Serbia and was expected to produce 286,000 tons per year of boric acid at full production.

In July 2025, one Australia-based mine developer delayed construction of its project in Nevada until March 2026 owing to an 80% decrease in lithium prices when compared with prices in 2022. It was initially expected to begin construction in 2025, and initial production was expected to begin in 2028. Once completed, the project was expected to have a 95-year mine life and produce about 170,000 tons of boric acid per year as a byproduct of lithium production.

On November 7, 2025, the U.S. Final 2025 List of Critical Minerals was published in the Federal Register (90 FR 50494). The changes in the 2025 list from the prior list published in 2022 (87 FR 10381) were the addition of copper, lead, potash, rhenium, silicon, and silver, based on the U.S. Geological Survey updated methodology for the 2025 list. As required by the Energy Act, public comment and interagency input were requested in response to the draft U.S. list of critical minerals published in the Federal Register (90 FR 41591). Based on that input, boron, metallurgical coal, phosphate, and uranium were also added.

World Production and Reserves: Significant revisions were made to the 2024 production for China, Peru, and Turkey based on company and Government reports.

	Production—All forms[e]		Reserves[3]
	2024	2025	
United States	W	W	48,000
Argentina, crude ore	160	170	NA
Bolivia, ulexite	230	380	NA
Chile, ulexite	470	300	35,000
China, boric oxide equivalent	210	230	9,100
Germany, compounds	45	40	NA
Peru, crude borates	190	220	4,000
Russia, datolite ore	90	80	40,000
Turkey, refined borates	1,800	1,500	950,000
World total[4]	XX	XX	XX

World Resources:[3] Deposits of borates are associated with volcanic activity and arid climates, with the largest economically viable deposits in the Mojave Desert of the United States, the Alpide belt along the southern margin of Eurasia, and the Andean belt of South America. In order of abundance, U.S. deposits consist primarily of tincal, kernite, and borates contained in brines, and to a lesser extent, ulexite and colemanite. About 70% of all deposits in Turkey are colemanite, primarily used in the production of heat-resistant glass. At current levels of consumption, world resources are adequate for the foreseeable future.

Substitutes: The substitution of other materials for boron is possible in detergents, enamels, insulation, and soaps. Sodium percarbonate can replace borates in detergents and requires lower temperatures to undergo hydrolysis, which is an environmental consideration. Some enamels can use other glass-producing substances, such as phosphates. Insulation substitutes include cellulose, foams, and mineral wools. In soaps, sodium and potassium salts of fatty acids can act as cleaning and emulsifying agents.

[e]Estimated. E Net exporter. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Defined as production + imports – exports.
[2]Defined as imports – exports.
[3]See Appendix C for resource and reserve definitions and information concerning data sources.
[4]World totals cannot be calculated because production and reserves are not reported in a consistent manner by all countries.

BROMINE

(Data in metric tons, bromine content, unless otherwise specified)

Domestic Production and Use: Bromine was recovered from underground brines by two companies in Arkansas. Bromine is one of the leading mineral commodities, in terms of value, produced in Arkansas. The two bromine companies in the United States account for a large percentage of world production capacity.

The leading global applications of bromine are for the production of brominated flame retardants (BFRs) and clear brine drilling fluids. Bromine compounds also are used in a variety of other applications, including industrial uses, as intermediates, and for water treatment. U.S. apparent consumption of bromine in 2025 was estimated to be less than that in 2024.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production	W	W	W	W	W
Imports for consumption, elemental bromine and compounds[1]	27,200	36,500	50,800	58,300	40,000
Exports, elemental bromine and compounds[2]	27,900	19,400	38,900	33,800	33,000
Consumption, apparent[3]	W	W	W	W	W
Price, average unit value of imports (cost, insurance, and freight), dollars per kilogram, bromine content	2.85	3.29	2.92	2.70	3.00
Employment, number[e]	1,100	1,100	1,100	1,100	1,100
Net import reliance[4] as a percentage of apparent consumption	E	<25	<25	<25	<25

Recycling: Some bromide solutions were recycled to obtain elemental bromine and to prevent the solutions from being disposed of as hazardous waste. For example, hydrogen bromide is emitted as a byproduct of several organic reactions; this byproduct can be recycled with virgin bromine brines and used as a source of bromine production. Bromine contained in plastics, such as BFRs, can be difficult and costly to remove because the BFR is often bound to the polymer or resin matrix; therefore, bromine will often be recycled via the parent polymer with the polymer used again in new products. The stability of BFRs may reduce or eliminate the need for incorporating additional flame retardants into new products made from recycled plastic because the recycled plastic may meet the same levels of fire safety as the virgin material. However, this stability may lead to the unintentional reintroduction of bromine or BFRs into new plastic product cycles. Bromine used in zinc-bromine batteries can be removed and completely recovered as bromine at the battery's end of life, purified, and used for new batteries. Available information was insufficient to estimate the quantity of bromine recovered and recycled.

Import Sources (2021–24):[5] Israel, 83%; Jordan, 12%; China,[6] 3%; and other, 2%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Bromine	2801.30.2000	5.5% ad valorem.
Hydrobromic acid	2811.19.3000	Free.
Potassium or sodium bromide	2827.51.0000	Free.
Ammonium, calcium, or zinc bromide	2827.59.2500	Free.
Potassium bromate	2829.90.0500	Free.
Sodium bromate	2829.90.2500	Free.
Methyl bromide[7]	2903.61.0000	Free.
Ethylene dibromide[8]	2903.62.1000	5.4% ad valorem.
Dibromoneopentylglycol	2905.59.3000	Free.
Tetrabromobisphenol A	2908.19.2500	5.5% ad valorem.
Decabromodiphenyl and octabromodiphenyl oxide	2909.30.0700	5.5% ad valorem.

Depletion Allowance: Brine wells, 5% (domestic and foreign).

Government Stockpile: None.

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BROMINE

Events, Trends, and Issues: The United States maintained its position as one of the leading bromine producers in the world along with China, Israel, and Jordan. In 2025, estimated total imports of bromine and bromine compounds (bromine content) decreased by about 30% from those in 2024, and the leading source of imports of bromine and bromide compounds (gross weight) through July 2025 was Israel (89%), followed by Jordan (6%). The average annual unit value of imported bromine and bromine compounds (bromine content) was approximately $3.00 per kilogram, which was 12% more than that in 2024. Together, the leading imported bromine products in terms of both gross weight and bromine content were bromides and bromide oxides of ammonium, calcium, or zinc and bromides of sodium or potassium, accounting for almost 90% of total imported bromine.

In 2025, estimated total exports (bromine content) decreased slightly compared with those in 2024, and the leading destinations for exports (gross weight) through July 2025 were Guyana (43%) and Saudi Arabia (20%). The average annual unit value of exported bromine and bromine compounds (bromine content) was approximately $3.20 per kilogram, slightly more than that in 2024.

Bromine production in Jordan continued without interruption from ongoing regional conflicts and achieved record production in the first half of 2025.

World Production and Reserves: Production in 2024 for Israel was revised significantly based on a Government report.

	Production[e]		Reserves[9]
	2024	2025	
United States	W	W	11,000,000
China	100,000	90,000	130,000
India	7,000	7,000	NA
Israel	[10]190,000	200,000	Large
Japan	20,000	20,000	NA
Jordan	[10]112,000	110,000	360,000
Ukraine	11,000	6,000	NA
World total (rounded)	[11]440,000	[11]430,000	Large

World Resources:[9] Bromine is found principally in seawater, evaporitic (salt) lakes, and underground brines associated with petroleum deposits. Seawater contains about 65 parts per million bromine, or an estimated 100 trillion tons. The Dead Sea, in the Middle East, is estimated to contain 1 billion tons of bromine. Bromine also is recovered from seawater as a coproduct during evaporation to produce salt.

Substitutes: Chlorine and iodine may be substituted for bromine in a few chemical reactions and for sanitation purposes. There are no comparable substitutes for bromine in various oil- and gas-well-completion and packer applications. Because plastics have a low ignition temperature, aluminum hydroxide, magnesium hydroxide, organic chlorine compounds, and phosphorus compounds can be substituted for bromine as fire retardants in some uses.

[e]Estimated. E Net exporter. NA Not available. W Withheld to avoid disclosing company proprietary data.
[1]Includes data for the Harmonized Tariff Schedule of the United States codes shown in the “Tariff” section.
[2]Includes data for the following Schedule B numbers: 2801.30.2000, 2827.51.0000, and 2827.59.0000 (for the years 2021–25); 2903.31.0000 and 2903.39.1520 (for 2021); and 2903.61.0000 and 2903.62.1000 (for the years 2022–25).
[3]Defined as production (sold or used) + imports – exports.
[4]Defined as imports – exports.
[5]Calculated using the gross weight of imports.
[6]Includes Hong Kong.
[7]Prior to 2022, was listed under Harmonized Tariff Schedule of the United States code 2903.39.1520.
[8]Prior to 2022, was listed under Harmonized Tariff Schedule of the United States code 2903.31.0000.
[9]See Appendix C for resource and reserve definitions and information concerning data sources.
[10]Reported.
[11]Excludes U.S. production.

CADMIUM

(Data in metric tons unless otherwise specified)

Domestic Production and Use: Cadmium is present in small amounts in most zinc ores and at zinc smelters is either recovered or treated as part of a waste stream. Although most domestically mined zinc ore is exported for smelting, one company produced an estimated 200 tons of cadmium metal as a byproduct from its zinc smelter in Tennessee, which processed both domestic and imported zinc concentrates. Cadmium metal and compounds are mainly consumed for nickel cadmium (NiCd) batteries, but also for alloys, coatings, and pigments. In recent years, cadmium has increasingly been used in semiconductors such as in cadmium-telluride (CdTe) thin-film solar panels, in cadmium-zinc-telluride (CdZnTe) substrates for radiation detectors and imaging applications, and cadmium selenide (CdSe) optoelectronic applications. In the consumer battery market, there has been a shift from NiCd batteries towards lithium-based batteries, which have higher energy densities, but the reliability and longevity of NiCd industrial batteries make them ideal for many applications. One company in Ohio recovered cadmium metal from the recycling of both consumer and industrial NiCd batteries.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production:					
Primary, refined[1]	241	212	375	180	200
Secondary	W	W	W	W	W
Imports for consumption:					
Unwrought cadmium and powders	155	99	72	6	10
Wrought cadmium and other articles	2	1	1	2	1
Cadmium waste and scrap	85	40	([2])	40	30
Cadmium oxide	14	33	37	13	40
Cadmium sulfide	—	([2])	—	41	—
Cadmium pigments and preparations based on cadmium compounds	101	146	147	126	170
Exports:					
Unwrought cadmium and powders	51	68	100	24	1
Wrought cadmium and other articles	217	60	21	33	30
Cadmium waste and scrap	—	2	15	—	—
Cadmium pigments and preparations based on cadmium compounds	550	747	947	471	760
Consumption of metal, apparent[3]	W	W	W	W	W
Price, metal, annual average,[4] dollars per kilogram	2.56	3.42	4.06	4.12	3.90
Net import reliance[5] as a percentage of apparent consumption	<50	<25	E	E	<25

Recycling: Secondary cadmium is mainly recovered from spent consumer and industrial NiCd batteries. Other waste and scrap from which cadmium can be recycled includes copper-cadmium alloy scrap, some complex nonferrous alloy scrap, cadmium-containing dust from electric-arc furnaces, and CdTe solar panels.

Import Sources (2021–24):[6] China,[7] 50%; Germany, 33%; Australia, 6%; Peru, 6%; and other, 5%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Cadmium oxide	2825.90.7500	Free.
Cadmium sulfide	2830.90.2000	3.1% ad valorem.
Pigments and preparations based on cadmium compounds	3206.49.6010	3.1% ad valorem.
Cadmium waste and scrap	8112.61.0000	Free.
Selenides and tellurides	2842.90.9010	3.3% ad valorem.
Unwrought cadmium and powders	8112.69.1000	Free.
Wrought cadmium and other articles	8112.69.9000	4.4% ad valorem.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile:[8] The fiscal year (FY) 2026 potential acquisitions were not available; FY 2025 potential acquisitions included 2,800 square centimeters of CdZnTe substrates.

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CADMIUM

Events, Trends, and Issues: The importance of semiconductor materials was highlighted by the mid-2025 addition of a subcategory for "selenides and tellurides" to the U.S. Harmonized Tariff Schedule. Although not all materials in this group contain cadmium, two important members are CdTe, increasingly used in the solar industry, and CdSe, used in optoelectronics. Quantum dots, nanocrystals that can be made from CdSe and have unique optical and electronic properties, were used in displays and medical imaging equipment and were being investigated for use in improving the performance of batteries and supercapacitors. Under the 3-year Cadmium Telluride Accelerator Consortium administered by the U.S. Department of Energy, research on improving CdTe cell efficiency continued. The leading domestic CdTe solar panel manufacturer began production in mid-2025 at a fifth facility, which was expected to increase domestic manufacturing capacity to about 14 gigawatts per year once fully ramped up in 2026.

World Refinery Production and Reserves: Significant revisions were made to the 2024 production for Australia, Bulgaria, Canada, China, the Netherlands, Poland, and Russia based on company and Government reports.

	Refinery production		Reserves[9]
	2024	2025[e]	
United States[1]	180	200	Quantitative estimates of reserves were not available. The cadmium content of typical zinc ores averages about 0.03%. See the Zinc chapter for zinc reserves.
Australia	601	600	
Bulgaria	379	380	
Canada[e]	1,300	1,300	
China[e]	8,900	9,500	
Germany[e]	130	220	
Japan[e]	1,580	1,300	
Kazakhstan[e]	1,100	1,100	
Korea, Republic of[e]	4,300	4,300	
Mexico	1,190	1,000	
Netherlands	592	600	
Norway[e]	350	430	
Peru	664	600	
Poland	382	400	
Russia[e]	1,000	1,000	
Uzbekistan[e]	170	230	
World total (rounded)	22,800	23,000	

World Resources:[9] Cadmium is generally recovered from zinc ores and concentrates. Sphalerite, the most economically significant zinc ore mineral, commonly contains minor amounts of cadmium, which shares certain similar chemical properties with zinc and often substitutes for zinc in the sphalerite crystal lattice.

Substitutes: Batteries with other chemistries, particularly lithium-ion, can replace NiCd batteries in many applications. Except where the surface characteristics of a coating are critical (for example, fasteners for aircraft), coatings such as zinc-nickel can be substituted for cadmium in many plating applications. Cerium sulfide is used as a replacement for cadmium pigments, mostly in plastics. Barium stabilizers can replace barium-cadmium stabilizers in flexible polyvinyl chloride (PVC) applications. CdTe solar panels compete with crystalline silicon solar panels.

[e]Estimated. E Net exporter. W Withheld to avoid disclosing company proprietary data. — Zero.
[1]Cadmium metal produced as a byproduct of zinc refining.
[2]Less than ½ unit.
[3]Defined as primary production + secondary production + imports of unwrought cadmium and powders – exports of unwrought cadmium and powders.
[4]Average free market price for 99.95% purity in 10-ton lots; cost, insurance, and freight; global ports. Source: Fastmarkets MB.
[5]Defined as imports of unwrought cadmium and powders – exports of unwrought cadmium and powders.
[6]Unwrought cadmium and powders; Harmonized Tariff Schedule of the United States code 8107.20.0000 for 2021 and 8112.69.1000 beginning in 2022.
[7]Includes Hong Kong.
[8]See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.
[9]See Appendix C for resource and reserve definitions and information concerning data sources.

CEMENT

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: In 2025, U.S. portland and blended cement production decreased to an estimated 82 million tons from an estimated 83 million tons, and masonry cement production decreased by 2.7% to an estimated 2.1 million tons. Cement was produced at 97 plants in 34 States and in Puerto Rico. Texas, Missouri, California, and Florida were, in descending order of output, the four leading cement-producing States and accounted for approximately 44% of the U.S. total. Overall, the U.S. cement industry and market continued to be constrained by closed or idle plants, underutilized capacity at others, ongoing plant upgrades, and the ready availability of imported cement. In 2025, shipments of cement were an estimated 100 million tons with an estimated value of $17 billion. In 2025, an estimated 70% to 75% of sales were to ready-mixed concrete producers, 11% to concrete product manufacturers, 8% to 10% to contractors, and 5% to 10% to other customer types.

Salient Statistics—United States:[1]	**2021**	**2022**	**2023**	**2024**	**2025**[e]
Production:					
Portland, blended, and masonry cement[2]	91,000	91,200	89,700	[e]85,000	84,000
Clinker	79,616	79,489	76,789	[e]72,000	69,000
Shipments to final customers, includes exports	108,969	111,092	110,290	[e]100,000	100,000
Imports for consumption:					
Hydraulic cement	19,937	24,985	24,986	23,675	23,000
Clinker	1,563	1,021	921	685	660
Exports, hydraulic cement and clinker	939	904	889	932	1,000
Consumption, apparent[3]	111,000	114,000	113,000	[e]110,000	110,000
Price, average mill unit value, dollars per metric ton	127	139	152	[e]160	160
Stocks, cement, yearend	6,280	8,010	8,830	[e]9,700	8,200
Employment, mine and mill, number[e]	12,300	12,800	13,000	13,000	13,000
Net import reliance[4] as a percentage of apparent consumption	19	22	22	22	21

Recycling: Cement is not recycled, but significant quantities of concrete are recycled for use as a construction aggregate. Cement kilns can use waste fuels, recycled cement kiln dust, and recycled raw materials such as slags and fly ash. Various secondary materials can be incorporated as supplementary cementitious materials (SCMs) in blended cements and in the cement paste in concrete.

Import Sources (2021–24):[5] Turkey, 32%; Canada, 20%; Vietnam, 13%; Greece, 9%; and other, 26%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Cement clinker	2523.10.0000	Free.
White portland cement	2523.21.0000	Free.
Other portland cement	2523.29.0000	Free.
Aluminous cement	2523.30.0000	Free.
Other hydraulic cement	2523.90.0000	Free.

Depletion Allowance: Not applicable. Certain raw materials for cement production have depletion allowances.

Government Stockpile: None.

Events, Trends, and Issues: The value of total construction put in place in the United States decreased by 1.8% during the first 8 months of 2025 compared with that in the same period in 2024. Both residential and nonresidential construction spending decreased. New privately owned housing starts through August 2025 increased by 0.7% compared with those during the same period in 2024; single family starts decreased by 4.9% but multifamily starts increased by 17.5%. Reported cement shipments decreased by 2.1% during the first 9 months of 2025 compared with those in the same period in 2024. The leading cement-consuming States continued to be Texas, Florida, and California, in descending order by tonnage.

According to the Bureau of Economic Analysis, the U.S. real gross domestic product (GDP) increased at an average rate of 1.6% during the first 6 months of 2025 compared with the real GDP for full year 2024. The Federal Reserve lowered interest rates in 2024 and 2025, and funding from the Bipartisan Infrastructure Law continued to be allocated to projects underway in each State (program funding from 2022 through 2026). Tariffs were imposed in 2025 that directly and indirectly affected the construction materials market. Apparent consumption of cement in 2025 was estimated to be unchanged from that in 2024.

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CEMENT

In February, a United States-based concrete and cement company acquired a United States-based cement company, and in October a separate United States-based cement company announced regulatory approval to divest a cement plant in Texas to the same United States-based concrete and cement company. In April, a Germany-based cement company completed the acquisition of a Mexico-based company that included a cement plant in South Carolina and several distribution and import terminals but excluded a cement plant in Pennsylvania. In June, a Swiss cement company finalized a spinoff of its North American business as an independent company. In October, a Turkey-based company opened a new grey cement grinding plant in Texas. Also in Texas, a bill restricting the operation of a cement kiln near a semiconductor wafer manufacturing facility was passed. Plans to expand cement plants in Missouri, Texas, and Wyoming progressed. A new granulated blast furnace slag-grinding facility was commissioned in the fourth quarter of 2024 in Texas, and construction of another grinding plant for slag cement commenced in June 2025 in Indiana. Numerous new or upgraded terminal facilities to expand storage capacity and improve distribution of cement and SCMs were announced. Sustainability initiatives continued, and minor upgrades were ongoing at some other domestic plants and terminals.

Blended cement accounted for 63% of total cement shipments during the first 9 months of 2025, and 95% of the blended shipments were estimated to be portland-limestone cement (Type IL). In March 2025, the U.S. Environmental Protection Agency announced it would reassess its 2024 “Final Reconsideration of the National Ambient Air Quality Standards for Particulate Matter (PM).” Many plants have installed emissions-reduction equipment to comply with the 2010 National Emissions Standards for Hazardous Air Pollutants (NESHAP). Some kilns could be shut, idled, or used at reduced capacity to comply with regulations, which would constrain U.S. clinker capacity. In 2022 and 2023, cement plant closures were announced in California, Maine, and New York; in 2025, the plant in Maine transitioned to new ownership that planned to continue to use it as a distribution center for imported material. In 2024, a cement plant in Indiana was repurposed into a slag-grinding facility.

World Production and Capacity:

	Cement production[e]		Clinker capacity[e]	
	2024	2025	2024	2025
United States (includes Puerto Rico)	85,000	84,000	100,000	100,000
Brazil	65,000	67,000	60,000	61,000
China	1,800,000	1,700,000	1,900,000	1,800,000
Egypt	53,000	64,000	60,000	75,000
India	440,000	470,000	380,000	400,000
Indonesia	68,000	64,000	79,000	83,000
Iran	71,000	68,000	85,000	85,000
Japan	46,000	44,000	50,000	50,000
Korea, Republic of	44,000	37,000	62,000	62,000
Mexico	44,000	42,000	42,000	42,000
Russia	67,000	59,000	80,000	80,000
Saudi Arabia	51,000	54,000	75,000	75,000
Turkey	85,000	89,000	100,000	100,000
Vietnam	91,000	100,000	110,000	110,000
Other countries (rounded)	860,000	860,000	650,000	650,000
World total (rounded)	3,900,000	3,800,000	3,800,000	3,800,000

World Resources: See the Lime and Stone (Crushed) chapters for cement raw-material resources.

Substitutes: Most portland cement is used to make concrete, mortars, or stuccos, and competes in the construction sector with concrete substitutes, such as aluminum, asphalt, clay brick, fiberglass, glass, gypsum (plaster), steel, stone, and wood. Certain materials, especially fly ash and ground granulated blast furnace slag, develop good hydraulic cementitious properties by reacting with lime, such as that released by the hydration of portland cement. Where readily available (including as imports), these SCMs are increasingly being used as partial substitutes for portland cement in many concrete applications and are components of finished blended cements.

[e]Estimated.

[1]Portland and blended cement plus masonry cement unless otherwise specified; excludes Puerto Rico unless otherwise specified.

[2]Includes cement made from imported clinker.

[3]Defined as production of cement (including from imported clinker) + imports (excluding clinker) – exports ± adjustments for stock changes. Estimated data have been rounded to two significant digits.

[4]Defined as imports (cement and clinker) – exports.

[5]Hydraulic cement and clinker; includes imports into Puerto Rico.

CESIUM

(Data in metric tons, cesium oxide, unless otherwise specified)

Domestic Production and Use: In 2025, no cesium was mined domestically, and the United States was 100% net import reliant for cesium minerals. Pollucite, mainly found in association with lithium-rich, lepidolite-bearing or petalite-bearing zoned granite pegmatites, is the principal cesium ore mineral. Cesium is used in relatively small-scale applications, using only a few grams for most applications. Owing to the lack of global availability of cesium, many applications have used mineral substitutes and the use of primary cesium in any particular application may no longer be viable. On the basis of consumption by quantity in end-use products, cesium carbonate and hydroxide are the leading cesium products consumed globally, followed by cesium formate, cesium iodide, cesium nitrate, and cesium chloride.

Cesium catalysts, such as cesium carbonate and cesium hydroxide, are used largely in industrial processes. Cesium catalysts have largely replaced potassium promoters in high-purity sulfuric acid manufacturing, which may enable lower plant stack emissions and lower ignition temperatures. Additionally, cesium catalysts are primarily used in methyl methacrylate manufacturing in place of conventional cyanide-based processes and are necessary to improve efficiency, lower operating costs, and reduce environmental impacts. Sulfuric acid catalysts and methyl methacrylate may be used in aerospace, automotive, and manufacturing applications. Cesium formate brines are used for high-pressure, high-temperature well drilling for oil and gas exploration and production. Cesium iodide is used primarily in X-ray panel production.

Cesium bromide may be used in infrared detectors, optics, photoelectric cells, scintillation counters, and spectrophotometers. Cesium carbonate may be used in the alkylation of organic compounds and in energy conversion devices, such as fuel cells, magneto-hydrodynamic generators, and polymer solar cells. Cesium chloride may be used in analytical chemistry applications as a reagent, in high-temperature solders, as an intermediate in cesium metal production, in isopycnic centrifugation, as a radioisotope in nuclear medicine, as an insect repellent in agricultural applications, and in specialty glasses. Cesium hydroxide may be used as an electrolyte in alkaline storage batteries. Cesium iodide may be used in fluoroscopy equipment as the input phosphor of X-ray image intensifier tubes, and in scintillators. Cesium metal may be used in the production of cesium compounds and photoelectric cells. Cesium nitrate may be used as a colorant and oxidizer in the pyrotechnic industry, in petroleum cracking, in scintillation counters, and in X-ray phosphors. Cesium sulfates may be used in water treatment, fuel cells, and to improve optical quality for scientific instruments.

Cesium isotopes, which are obtained as a byproduct in nuclear fission or formed from other isotopes, may be used in electronic, medical, metallurgical, and research applications. Cesium isotopes are used as an atomic resonance frequency standard in atomic clocks, playing a vital role in aircraft guidance systems, global positioning satellites, and internet and cellular telephone transmissions. Cesium-131 was used in medical products for treatment of various cancers. Cesium-137 may be used in industrial gauges, in mining and geophysical instruments, and for sterilization of food, sewage, and surgical equipment. Because of the danger posed by the radiological properties of cesium-137, Congress set a goal for the National Nuclear Security Administration to eliminate cesium-137 blood irradiators by 2027 in the United States. Alternatives, including X-ray irradiators, have been developed with similar capabilities and have been partially implemented.

Salient Statistics—United States: Consumption, import, and export data for cesium have not been available since the late 1980s. Because cesium metal is not traded in commercial quantities, a market price is unavailable. It is estimated that no more than a few thousand kilograms of cesium chemicals are consumed in the United States every year. The United States was 100% net import reliant for its cesium needs, and the primary global producers were estimated to include Canada, China, Germany, and Russia.

In 2025, one company offered 1-gram ampoules of 99.8% (metal basis) cesium for $104.00, a 6% increase from $98.00 in 2024, and 99.98% (metal basis) cesium for $132.00, a 6% increase from $124 in 2024. At the end of September 2025, the prices for 50 grams of 99.9% (metal basis) cesium acetate, cesium bromide, cesium carbonate, cesium chloride, and cesium iodide were $161.20, $111.00, $146.40, $166.00, and $185.80, respectively, with increases ranging from 7% to 8% compared with prices in 2024. The price for a cesium-plasma standard solution (10,000 micrograms per milliliter) in 2025 was $102.00 for 50 milliliters and $155.00 for 100 milliliters, increases of 9% from $93.40 and $142.00 in 2024, respectively. The price for 25 grams of 98% (metal basis) cesium formate was $56.10, a 7% increase from $52.40 in 2024.

Recycling: Cesium formate brines are typically rented by oil and gas exploration clients. After completion of the well, the used cesium formate brine is returned and reprocessed for subsequent drilling operations. Cesium formate brines are recycled, recovering nearly 85% of the brines for recycling to be reprocessed for further use. Cesium iodide is recycled from radiography panels and used in the production of new panels.

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CESIUM

Import Sources (2021–24): No reliable data have been available to determine the source of cesium ore imported by the United States since 1988. Prior to 2016, Canada was estimated to be the primary supplier of cesium ore and refined chemicals. Based on recent import data, it was estimated that China and Germany were sources of cesium chemicals.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Alkali metals, other	2805.19.9000	5.5% ad valorem.
Chlorides, other	2827.39.9000	3.7% ad valorem.
Bromides, other	2827.59.5100	3.6% ad valorem.
Iodides, other	2827.60.5100	4.2% ad valorem.
Sulfates, other	2833.29.5100	3.7% ad valorem.
Nitrates, other	2834.29.5100	3.5% ad valorem.
Carbonates, other	2836.99.5000	3.7% ad valorem.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Domestic cesium occurrences will likely remain subeconomic unless market conditions change. No known human health issues are associated with exposure to naturally occurring cesium, and its use has minimal environmental impacts. Manufactured radioactive isotopes of cesium have been known to cause adverse health effects. Certain cesium compounds may be toxic if consumed. Food that has been irradiated using the radioisotope cesium-137 has been found to be safe by the U.S. Food and Drug Administration.

During 2025, one company in Canada reported intermittent cesium production and processing from mined ore and stockpiles at the Tanco Mine. The recovery and processing of cesium from tailings at the Bikita Mine in Zimbabwe for shipment to China was restarted in recent years. Throughout 2025, multiple projects that could produce cesium as a byproduct of lepidolite, pollucite, spodumene, or zinnwaldite mining, focused primarily on lithium or rubidium extraction, were in the exploration and feasibility stages in Canada, Laos, Namibia, and the United States. One company that was developing a lepidolite (hard-rock) mine and processing facility in Namibia brought in an independent administrator owing to the lack of project financing at the end of 2024. Another company was in the process of securing financing to take ownership of the project as of September 2025. Based on historical information, the Namibia project contained a Joint Ore Reserves Committee-compliant measured and indicated mineral resource estimate totaling 3,100 tons of cesium.

One company developed a recycling program for X-ray panels in 2020 that recovered cesium iodide during the production process for reproduction into new panels, which was believed to now be the industry standard.

World Mine Production and Reserves:[1] There were no official sources for cesium production data. Cesium reserves are estimated based on the occurrence of pollucite, a primary cesium mineral. Most pollucite contains 5% to 32% cesium oxide. No reliable data were available to determine reserves for specific countries; however, Australia, Canada, China, and Namibia were estimated to have reserves totaling less than 200,000 tons. An estimated 11,000 tons of cesium formate were in use, with 5% being depleted and replaced per year.

World Resources:[1] Cesium is associated with lithium-bearing pegmatites worldwide, and cesium resources have been identified in Australia, Canada, Namibia, the United States, and Zimbabwe. In the United States, pollucite occurs in pegmatites in Alaska, Maine, and South Dakota. Lower concentrations occur in brines in Chile and China and in geothermal systems in China, Germany, and India. China was estimated to have cesium-rich deposits of geyserite, lepidolite, and pollucite, with concentrations highest in Yichun, Jiangxi Province, although no resource, reserve, or production estimates were available. Cesium-bearing clays have been identified in Laos and in situ extraction was being researched.

Substitutes: Cesium and rubidium can be used interchangeably in many applications because they have similar physical properties and atomic radii. Cesium, however, is more electropositive than rubidium, making it a preferred material for some applications. Rubidium is mined from similar deposits in smaller quantities as a byproduct of cesium production in pegmatites and as a byproduct of lithium production from lepidolite mining and processing, making it no more readily available than cesium.

[1]See Appendix C for resource and reserve definitions and information concerning data sources.

CHROMIUM

(Data in thousand metric tons, chromium content, unless otherwise specified)

Domestic Production and Use: In 2025, the United States consumed an estimated 4% of world chromite ore production in various forms of imported materials, such as chromite ore, chromium chemicals, ferrochromium, chromium metal, and stainless steel. Imported chromite ore was consumed by one company to produce chromium chemicals. Stainless-steel and heat-resisting-steel producers were the leading consumers of ferrochromium. Stainless steels and superalloys require the addition of chromium via chromium-containing scrap, chromium metal, or ferrochromium. The value of chromium material consumption was estimated to be $720 million in 2025 (as measured by the value of net imports, excluding stainless steel), which was a 15% decrease from $852 million in 2024.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production:					
Mine	—	—	—	—	—
Secondary[1]	147	138	126	103	100
Imports for consumption[2]	571	610	451	492	520
Exports[2]	114	162	178	148	140
Shipments from Government stockpile[3]	7	5	NA	NA	NA
Consumption (includes recycling):					
Reported	389	328	365	[e]360	360
Apparent[4]	612	591	399	442	480
Price:[5]					
Chromite ore (gross weight), dollars per metric ton	199	277	321	331	290
Ferrochromium (chromium content), dollars per pound[6]	1.50	3.19	2.55	1.76	1.60
Chromium metal (gross weight), dollars per pound	4.23	7.20	5.05	5.30	5.90
Stocks, consumer, yearend	6	5	5	[e]5	5
Net import reliance[7] as a percentage of apparent consumption	76	77	68	77	79

Recycling: In 2025, recycled chromium (contained in reported stainless-steel scrap receipts) accounted for 21% of apparent consumption.

Import Sources (2021–24): Chromite (ores and concentrates): South Africa, 96%; Turkey, 3%; and other, 1%. Chromium-containing chemicals: Kazakhstan, 25%; China, 19%; Germany, 14%; India, 13%; and other, 29%. Chromium-containing scrap:[8] Canada, 50%; Mexico, 45%; and other, 5%. Chromium metal: China, 40%; United Kingdom, 26%; Russia, 15%; France, 14%; and other, 5%. Ferrochromium: South Africa, 41%; Kazakhstan, 24%; Russia, 6%; Finland, 5%, and other, 24%. Stainless steel: Taiwan, 16%, Finland, 12%, India, 11%, China,[9] 6%; and others, 55%. Total imports: South Africa, 31%; Kazakhstan, 11%; Finland, 6%; Canada, 5%; and other, 47%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Chromium ores and concentrates:		
Not more than 40% chromic oxide (Cr_2O_3)	2610.00.0020	Free.
More than 40% but less than 46% Cr_2O_3	2610.00.0040	Free.
More than or equal to 46% Cr_2O_3	2610.00.0060	Free.
Ferrochromium:		
More than 4% carbon	7202.41.0000	1.9% ad valorem.
More than 3% but less than 4% carbon	7202.49.1000	1.9% ad valorem.
More than 0.5% but less than 3% carbon	7202.49.5010	3.1% ad valorem.
Not more than 0.5% carbon	7202.49.5090	3.1% ad valorem.
Ferrosilicon chromium	7202.50.0000	10% ad valorem.
Stainless-steel scrap	7204.21.0000	Free.
Chromium metal:		
Unwrought, powder	8112.21.0000	3% ad valorem.
Waste and scrap	8112.22.0000	Free.
Other	8112.29.0000	3% ad valorem.

Depletion Allowance:[10] 22% (domestic), 14% (foreign).

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CHROMIUM

Government Stockpile (gross weight):[10]

	FY 2025		FY 2026	
Material	**Potential acquisitions**	**Potential disposals**	**Potential acquisitions**	**Potential disposals**
Ferrochromium[11]	—	21.8	NA	NA
Chromium metal	—	0.454	NA	NA

Events, Trends, and Issues: South Africa was the leading chromite ore producer. Global chromite ore mine production was estimated to have increased by 3% in 2025 compared with production in 2024. Challenges related to shifting market demands, particularly in China, combined with deep-level mining and labor costs and an unreliable supply of electricity could affect production in South Africa. Investment, major expansions, and new mines may increase the production of chromite ore in Brazil, Kazakhstan, and Zimbabwe.

China was the leading ferrochromium- and stainless-steel-producing country and the leading chromium-consuming country. However, the production of stainless steel in China has been affected by oversupply and decreases in consumer demand, which may have contributed to decreases in the price of ferrochromium. Potential export controls and tariffs on chromite ore from South Africa may also affect ferrochromium production in China.

World Mine Production and Reserves:[12] Significant revisions were made to the 2024 production for India, South Africa, Turkey, and Zimbabwe based on Government reports.

	Mine production		Reserves[13]	
	2024	**2025[e]**	**Ore**	**Cr_2O_3 content**
United States	—	—	8,500	630
Brazil	[e]1,400	2,000	3,900	1,000
Finland	1,940	1,900	63,000	16,000
India	3,370	3,000	79,000	27,000
Kazakhstan	[e]6,100	7,000	[14]230,000	100,000
South Africa	22,900	23,000	350,000	110,000
Turkey	9,300	9,000	27,000	5,700
Zimbabwe	1,600	2,000	140,000	78,000
Other countries	3,000	3,000	NA	NA
World total (rounded)	49,600	51,000	>1,200,000	>540,000

World Resources:[13] World resources are greater than 12 billion tons of shipping-grade chromite, sufficient to meet conceivable demand for centuries. World chromium resources are heavily geographically concentrated (95%) in Kazakhstan and southern Africa; United States chromium resources are mostly in the Stillwater Complex in Montana.

Substitutes: Chromium has no substitute in stainless steel, the leading end use, or in superalloys, the major strategic end use. Chromium-containing scrap can substitute for ferrochromium in some metallurgical uses.

[e]Estimated. NA Not available. — Zero.
[1]Secondary production is based on reported receipts of all types of stainless-steel scrap.
[2]Includes chromium chemicals, chromium metal, chromite ores, ferrochromium, ferrosilicon chromium, and stainless-steel products and scrap.
[3]Defined as change in total inventory from prior yearend inventory. Beginning in 2023, Government stock changes no longer available.
[4]Defined for 2021–22 as production (from mines and secondary) + imports – exports ± adjustments for Government and industry stock changes. Beginning in 2023, Government stock changes no longer included.
[5]Source: Argus Media group, Argus Non-Ferrous Markets.
[6]Excludes ferrosilicon chromium.
[7]Defined for 2021–22 as imports – exports ± adjustments for Government and industry stock changes. Beginning in 2023, Government stock changes no longer included.
[8]Chromium-containing scrap includes chromium metal scrap and stainless-steel scrap.
[9]Includes Hong Kong.
[10]See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.
[11]High-carbon and low-carbon ferrochromium, combined.
[12]Mine production and ore reserves are reported in gross weight.
[13]See Appendix C for resource and reserve definitions and information concerning data sources.
[14]Reserves for Kazakhstan are likely based on the State Committee of the Russian Federation (GKZ) classification system A+B+C1+C2, where A reserves are well established, B reserves have been explored, and C1+C2 reserves are less explored and have lower confidence levels. The reference for Kazakhstan's reserves did not provide data for A reserves. C2 reserves were excluded here.

CLAYS

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: Production of clays (sold or used) in the United States was estimated to be 26 million tons valued at $1.8 billion in 2025, with about 120 companies operating clay and shale mines in 38 States. Principal domestic uses for specific clays were estimated to be as follows: ball clay (53% floor and wall tile), bentonite (48% pet waste absorbents and 22% drilling mud), common clay (43% brick, 31% lightweight aggregate, and 21% cement), fuller's earth (79% absorbents, including oil and grease absorbents, pet waste absorbents, and miscellaneous absorbents), and kaolin (56% fillers, extenders, and binders and 20% ceramics). Fire clay uses were withheld to avoid disclosing company proprietary data.

In 2025, the United States exported an estimated 640,000 tons of bentonite; Canada, Japan, and Mexico, in decreasing order, were the estimated leading destinations. About 1.6 million tons of kaolin was exported mainly as a paper coating and filler; a component in ceramic bodies; and fillers and extenders in paint, plastic, and rubber products; Mexico, Japan, and China, in decreasing order, were the estimated leading destinations. Lesser quantities of ball clay, fire clay, and fuller's earth were exported.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production (sold or used):					
Ball clay[e]	1,080	1,030	1,000	935	990
Bentonite[1]	4,580	4,580	4,340	3,990	4,100
Common clay[1]	12,800	13,000	12,600	12,900	13,000
Fire clay[1]	675	622	685	688	720
Fuller's earth[e, 2]	2,190	2,260	2,380	2,440	2,400
Kaolin[e]	4,390	4,390	4,600	4,640	4,800
Total[2, 3]	25,700	25,900	25,600	25,600	26,000
Imports for consumption:					
Artificially activated clays and earths	41	58	72	68	59
Kaolin	149	200	125	176	19
Other	47	49	35	66	59
Total[3]	237	306	232	310	140
Exports:					
Artificially activated clays and earths	139	134	92	103	96
Ball clay	139	165	145	174	320
Bentonite	861	830	785	740	640
Clays, not elsewhere classified	186	208	194	212	400
Fire clay[4]	210	158	133	147	130
Fuller's earth	83	87	70	71	70
Kaolin	2,330	2,020	1,510	1,640	1,600
Total[3]	3,950	3,610	2,930	3,080	3,300
Consumption, apparent[5]	22,000	22,600	22,900	22,800	23,000
Price, average unit value, ex-works, dollars per metric ton:					
Ball clay	46	47	46	47	47
Bentonite	100	101	103	105	110
Common clay	17	17	18	21	21
Fire clay	12	12	15	17	17
Fuller's earth[2]	90	91	90	89	88
Kaolin	151	156	160	162	170
Employment (excludes office workers), number:[e]					
Mine (may not include contract workers)	1,060	1,060	1,110	1,200	1,100
Mill	4,240	4,240	4,320	4,400	4,600
Net import reliance[6] as a percentage of apparent consumption	E	E	E	E	E

Recycling: Insignificant.

Import Sources (2021–24): All clay types combined: Brazil, 56%; Mexico, 24%; Canada, 3%; China 3%; and other, 14%.

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CLAYS

Tariff:

Item	Number	Normal Trade Relations 12–31–25
Kaolin and other kaolinic clays, whether or not calcined	2507.00.0000	Free.
Bentonite	2508.10.0000	Free.
Fire clay	2508.30.0000	Free.
Common blue clay and other ball clays	2508.40.0110	Free.
Decolorizing earths and fuller's earth	2508.40.0120	Free.
Other clays	2508.40.0150	Free.
Chamotte or dinas earth	2508.70.0000	Free.
Activated clays and activated earths	3802.90.2000	2.5% ad valorem.

Depletion Allowance: Ball clay, bentonite, fire clay, fuller's earth, and kaolin, 14% (domestic and foreign); clay used in the manufacture of common brick, lightweight aggregate, and sewer pipe, 7.5% (domestic and foreign); clay used in the manufacture of drain and roofing tile, flowerpots, and kindred products, 5% (domestic and foreign); clay from which alumina and aluminum compounds are extracted, 22% (domestic).

Government Stockpile: None.

Events, Trends, and Issues: The total tonnage of clays sold or used by domestic producers increased from that in 2024. Imports for all types of clay decreased to 140,000 tons compared with 310,000 tons in 2024. There has been a reduction in kaolin imports from Brazil since mid-2024. The July 2024 acquisition of a division of a major industrial mineral company that owned a large kaolin operation in Brazil may have contributed to the decrease. U.S. apparent consumption of total clays in 2025 was estimated to be 23 million tons, compared with 22.8 million tons in 2024.

World Mine Production and Reserves:[7] Significant revisions were made to the 2024 production for some countries based on company and Government reports. Global reserves are large, but country-specific data were not available.

	Mine production					
	Bentonite		Fuller's earth		Kaolin	
	2024	2025[e]	2024	2025[e]	2024	2025[e]
United States[1]	3,990	4,100	[2]2,440	[2]2,400	[e]4,640	4,800
China	[e]2,100	2,100	—	—	[e]7,800	7,800
Czechia	185	190	—	—	[8]2,420	[8]2,400
Greece	[8]1,030	[8]1,000	[e]49	50	—	—
India	[e]3,700	3,700	[e]730	730	[e, 8]8,370	[8]8,400
Iran	[e]1,300	1,300	—	—	[e]2,100	2,100
Mexico	[e]77	80	[e]120	120	[e]52	50
Russia	[e]35	40	—	—	[e]5,000	5,000
Senegal	—	—	[e]190	190	—	—
Spain	[e]120	120	[e]693	690	[8]403	[8]400
Turkey	2,530	2,500	26	30	2,000	2,000
Uzbekistan	[e]60	60	—	—	[e]5,400	6,000
Other countries	4,290	4,300	189	190	10,900	11,000
World total (rounded)[3]	19,400	20,000	[2]4,430	[2]4,400	49,100	50,000

World Resources:[7] Resources of all clays are extremely large.

Substitutes: Clays compete with calcium carbonate in filler and extender applications; diatomite, organic pet litters, polymers, silica gel, and zeolites as absorbents; and various siding and roofing types in building construction.

[e]Estimated. E Net exporter. — Zero.
[1]Includes U.S. Geological Survey estimates.
[2]Does not include U.S. production of attapulgite.
[3]Data may not add to totals shown because of independent rounding.
[4]Includes refractory-grade kaolin.
[5]Defined as production (sold or used) + imports – exports.
[6]Defined as imports – exports.
[7]See Appendix C for resource and reserve definitions and information concerning data sources.
[8]Includes production of crude ore.

COBALT

(Data in metric tons, cobalt content, unless otherwise specified)

Domestic Production and Use: In 2025, the Eagle Mine, a nickel-copper mine in Michigan, produced cobalt-bearing nickel concentrate, which was exported to Canada or overseas for processing. Most U.S. cobalt supply consisted of imports and secondary (scrap) materials. About five companies in the United States produced cobalt chemicals. An estimated 51% of cobalt consumed in the United States was used in superalloys, mainly for aircraft gas turbine engines; 25% in a variety of chemical applications; 15% in various other metallic applications; and 9% in cemented carbides for cutting and wear-resistant applications. The total estimated value of cobalt consumed in 2025 was $320 million.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production:[e]					
Mine	650	500	500	200	300
Secondary[1]	1,800	1,920	2,030	2,050	2,000
Imports for consumption	9,790	10,500	9,500	10,800	14,000
Exports	4,930	5,360	5,110	4,880	4,500
Consumption (includes secondary):					
Estimated[2]	7,270	7,570	7,840	7,830	8,000
Apparent[e, 3]	6,650	7,150	6,440	7,960	9,600
Price, average, dollars per pound:					
U.S. spot, cathode[4]	24.21	30.78	17.20	16.77	21
London Metal Exchange (LME), cash	23.17	28.83	15.48	11.84	15
Stocks, yearend:					
Industry[e, 2, 5]	1,010	946	925	956	1,500
LME, U.S. warehouse	50	34	34	34	34
Net import reliance[6] as a percentage of apparent consumption	73	73	69	74	79

Recycling: In 2025, cobalt content of purchased scrap represented 25% of estimated cobalt consumption.

Import Sources (2021–24): Metal, oxide, and salts: Norway, 26%; Finland, 16%; Canada, 14%; Japan, 14%; and other, 30%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Cobalt ores and concentrates	2605.00.0000	Free.
Chemical compounds:		
Cobalt oxides and hydroxides; cobalt oxide	2822.00.0010	0.1% ad valorem.
Cobalt oxides and hydroxides; other	2822.00.0090	0.1% ad valorem.
Cobalt sulfates	2833.29.1000	1.4% ad valorem.
Cobalt carbonates	2836.99.1000	4.2% ad valorem.
Cobalt acetates	2915.29.3000	4.2% ad valorem.
Unwrought cobalt, alloys	8105.20.3000	4.4% ad valorem.
Unwrought cobalt, other	8105.20.6000	Free.
Cobalt mattes and other intermediate products; cobalt powders	8105.20.9000	Free.
Cobalt waste and scrap	8105.30.0000	Free.
Wrought cobalt and cobalt articles	8105.90.0000	3.7% ad valorem.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile:[7]

	FY 2025		FY 2026	
Material	Potential acquisitions	Potential disposals	Potential acquisitions	Potential disposals
Cobalt alloys, gross weight[8]	60	—	NA	NA

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COBALT

Events, Trends, and Issues: Congo (Kinshasa) was the world's leading source of mined cobalt and accounted for an estimated 73% of world total, followed by Indonesia, which accounted for 14%. In February, Congo (Kinshasa) temporarily banned cobalt exports to address market oversupply and low prices. In October, the temporary ban was replaced with export quotas of 18,125 tons of contained cobalt for the remainder of 2025, and up to 96,600 tons contained cobalt per year in 2026 and 2027, inclusive of 9,600 tons for national strategic reserves. Uncertainty in supply availability following the announcement of the Congo (Kinshasa) export ban likely contributed to the sharp increase in estimated United States imports and industry stocks during the year. China remained the world leading producer of refined cobalt and the world leading consumer, primarily for the lithium-ion battery industry. In 2025, the United States published a solicitation to procure 7,480 tons of cobalt over a period of 5 years for the National Defense Stockpile. The solicitation was cancelled before the end of the year.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Australia, Canada, and Indonesia based on company and Government reports. Reserves for Indonesia, Papua New Guinea, Russia, and "Other countries" were revised based on company and Government reports.

	Mine production[e]		Reserves[9]
	2024	2025	
United States	200	300	70,000
Australia	4,780	3,700	[10]1,700,000
Canada	3,350	3,500	220,000
China	2,000	2,000	160,000
Congo (Kinshasa)	226,000	230,000	6,000,000
Cuba	3,450	2,000	500,000
Indonesia	35,000	44,000	760,000
Madagascar	3,100	3,900	100,000
Papua New Guinea	2,630	2,800	84,000
Philippines	3,100	3,700	260,000
Russia	8,000	7,700	[11]800,000
Turkey	2,200	1,900	91,000
Other countries	7,780	9,100	780,000
World total (rounded)	302,000	310,000	12,000,000

World Resources:[9] Identified cobalt resources of the United States are estimated to be about 1 million tons. Most of these resources are in Minnesota. Other notable occurrences are in Alaska, California, Idaho, Michigan, Missouri, Montana, Oregon, and Pennsylvania. Identified world terrestrial cobalt resources are about 25 million tons, the vast majority of which are in sediment-hosted stratiform copper deposits in Congo (Kinshasa) and Zambia; nickel-bearing laterite deposits in Australia and nearby island countries and Cuba; and magmatic nickel-copper sulfide deposits of mafic and ultramafic rocks in Australia, Canada, Russia, and the United States. An estimated 5 billion tons of cobalt is contained globally in sea floor polymetallic nodules.

Substitutes: Depending on the application, substitution for cobalt could result in a loss in product performance or increased cost. The cobalt content of lithium-ion batteries, the leading global use for cobalt, was being decreased; cobalt-free substitutes that use iron and phosphorus held significant market share in China. Potential substitutes in other applications include barium or strontium ferrites, neodymium-iron-boron alloys, or nickel-iron alloys in magnets; cerium, iron, lead, manganese, or vanadium in paints; cobalt-iron-copper or iron-copper in diamond tools; copper-iron-manganese for curing unsaturated polyester resins; iron, iron-cobalt-nickel, nickel, ceramic-metallic composites (cermets), or ceramics in cutting and wear-resistant materials; nickel-base alloys or ceramics in jet engines; nickel in petroleum catalysts; rhodium in hydroformylation catalysts; and titanium-base alloys in prosthetics.

[e]Estimated. NA Not available. — Zero.
[1]Estimated from consumption of purchased scrap.
[2]Includes reported data and U.S. Geological Survey estimates.
[3]Defined for 2021–22 as secondary production + imports – exports ± adjustments for Government and industry stock changes for refined cobalt. Beginning in 2023, Government stock changes no longer included.
[4]Source: S&P Global Platts Metals Week. Cobalt cathode is refined cobalt metal produced by an electrolytic process.
[5]Stocks held by consumers and processors; excludes stocks held by trading companies and held for investment purposes.
[6]Defined for 2021–22 as imports – exports ± adjustments for Government and industry stock changes for refined cobalt. Beginning in 2023, Government stock changes no longer included.
[7]See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.
[8]Samarium-cobalt alloy; excludes potential disposals of aerospace alloys.
[9]See Appendix C for resource and reserve definitions and information concerning data sources.
[10]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 680,000 tons.
[11]Data from the Russia Ministry of Natural Resources.

COPPER

(Data in thousand metric tons, copper content, unless otherwise specified)

Domestic Production and Use: In 2025, the recoverable copper content of U.S. mine production was an estimated 1.0 million tons, a decrease of 5% from that in 2024, and was valued at an estimated $11 billion, 10% greater than $10.0 billion in 2024. Arizona was the leading copper-producing State and accounted for approximately 70% of domestic output; copper was also mined in Alaska, Michigan, Missouri, Montana, Nevada, New Mexico, and Utah. Copper was recovered or processed at 26 mines (17 of which accounted for more than 99% of mine production), 2 primary smelters, 2 secondary smelters, 2 primary electrolytic refineries, 14 electrowon refineries, and 4 secondary refineries. Refined copper and scrap were consumed at about 30 brass mills, 14 rod mills, and several hundred foundries and miscellaneous manufacturers. According to the Copper Development Association, copper and copper alloy products were used in building construction, 42%; electrical and electronic products, 23%; transportation equipment, 18%; consumer and general products, 10%; and industrial machinery and equipment, 7%.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production:					
Mine, recoverable	1,230	1,230	1,130	1,050	1,000
Refinery:					
Primary (from ore)	931	917	843	882	790
Secondary (from scrap)	49	40	39	39	60
Copper recovered from old (post-consumer) scrap[1]	169	152	137	[e]140	160
Imports for consumption:					
Ore and concentrate	11	12	3	([2])	([2])
Refined	919	732	771	903	1,700
Exports:					
Ore and concentrate	344	351	339	326	340
Refined	48	27	29	72	110
Consumption:					
Reported, refined copper	1,750	1,720	1,580	1,580	1,700
Apparent, primary refined copper and copper from old scrap[3]	1,970	1,810	1,680	1,860	2,200
Price, annual average, cents per pound:					
U.S. producer, cathode (COMEX + premium)	432.3	410.8	395.3	431.8	490
COMEX, high-grade, first position	424.3	400.7	385.7	421.6	480
London Metal Exchange, grade A, cash	422.5	399.8	384.8	414.7	440
Stocks, refined, held by U.S. producers, consumers, and metal exchanges, yearend	117	84	128	123	450
Employment, mine and plant, number	11,400	12,000	12,600	13,000	13,000
Net import reliance[4] as a percentage of apparent consumption	44	41	42	45	57

Recycling: Old (post-consumer) scrap, converted to refined metal, alloys, and other forms, provided an estimated 160,000 tons of copper in 2025, and an estimated 760,000 tons of copper was recovered from new (manufacturing) scrap derived from fabricating operations. Brass and wire-rod mills accounted for approximately 80% of the total copper recovered from scrap. Copper recovered from scrap contributed about 30% of the U.S. copper supply.[5]

Import Sources (2021–24): Copper content of blister and anodes: Finland, 88%; Malaysia, 3%; United Kingdom, 3%; and other, 6%. Copper content of matte, ash, and precipitate: Canada, 52%; Belgium, 24%; Japan, 9%; Spain, 6%; and other, 9%. Copper content of ore and concentrate: Canada, >99%; and other, <1%. Copper content of scrap: Canada, 45%; Mexico, 43%; and other, 12%. Refined copper: Chile, 68%; Canada, 16%; Peru, 7%; Mexico, 6%; and other, 3%. Refined copper accounted for 88% of all unmanufactured copper imports.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Copper ore and concentrate, copper content	2603.00.0010	1.7¢/kg on lead content.
Unrefined copper anodes for electrolytic refining	7402.00.0000	Free.
Refined copper and copper alloys, unwrought	7403.00.0000	1% ad valorem.
Copper scrap	7404.00.0000	Free.
Wire rod of refined copper	7408.11.0000	1% or 3% ad valorem.

Depletion Allowance: 15% (domestic), 14% (foreign).

Government Stockpile: None.

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COPPER

Events, Trends, and Issues: In 2025, production of copper was affected by concentrator shutdowns and lower ore grades at multiple mines in the United States. Domestic output of refined copper decreased by an estimated 9% compared with that in 2024 owing to planned maintenance of both primary smelters. As of September, copper production started in 2025 at a new mine in Arizona, at a new secondary smelter in Georgia, and at a new secondary refinery in Kentucky. By yearend, one additional mine in Arizona was expected to begin commercial operations.

The COMEX copper price was projected to average a record high of $4.80 per pound in 2025, 14% greater than $4.22 per pound in 2024. Analysts attributed the increase primarily to uncertainty regarding the implementation of tariffs on U.S. imports of copper materials.

On November 7, 2025, the U.S. Final 2025 List of Critical Minerals was published in the Federal Register (90 FR 50494). The changes in the 2025 list from the prior list published in 2022 (87 FR 10381) were the addition of copper, lead, potash, rhenium, silicon, and silver, based on the U.S. Geological Survey (USGS) updated methodology for the 2025 list. As required by the Energy Act, public comment and interagency input were requested in response to the draft U.S. list of critical minerals published in the Federal Register (90 FR 41591). Based on that input, boron, metallurgical coal, phosphate rock, and uranium were also added.

World Mine and Refinery Production and Reserves: Reserves for Canada, Chile, Peru, Poland, and "Other countries" were revised based on company, Government, and industry association reports.

	Mine production		Refinery production		Reserves[6]
	2024	2025[e]	2024	2025[e]	
United States	1,050	1,000	921	850	47,000
Australia	765	730	434	460	[7]100,000
Canada	515	500	324	320	7,000
Chile	5,510	5,300	1,940	1,700	180,000
China	1,840	1,800	12,400	14,000	41,000
Congo (Kinshasa)	2,990	3,200	2,560	2,800	80,000
Germany	—	—	597	610	—
India	27	23	545	620	2,200
Indonesia	1,010	710	349	400	21,000
Japan	—	—	1,570	1,400	—
Kazakhstan	724	710	498	500	20,000
Korea, Republic of	—	—	604	610	—
Mexico	717	690	489	480	53,000
Peru	2,740	2,700	385	340	85,000
Poland	400	410	589	560	33,000
Russia	1,020	1,300	896	950	80,000
Zambia	823	940	189	270	21,000
Other countries	2,850	3,000	2,310	2,100	210,000
World total (rounded)	23,000	23,000	27,600	29,000	980,000

World Resources:[6] The most recent USGS assessment of global copper resources indicated that, as of 2015, identified resources contained 1.5 billion tons of unextracted copper (2.1 billion tons when past production of 600 million tons is included) and undiscovered resources contained an estimated 3.5 billion tons of copper.[8]

Substitutes: Aluminum substitutes for copper in automobile radiators, cooling and refrigeration tube, electrical equipment, and power cable. Optical fiber substitutes for copper in telecommunications applications, and plastics substitute for copper in drain pipe, plumbing fixtures, and water pipe. Titanium and steel are used in heat exchangers.

[e]Estimated. — Zero.
[1]Copper converted to refined metal, alloys, and other forms by brass and wire-rod mills, foundries, refineries, and other manufacturers.
[2]Less than ½ unit.
[3]Primary refined production + copper recovered from old scrap + refined imports – refined exports ± adjustments for refined copper stock changes.
[4]Defined as refined imports – refined exports ± adjustments for refined copper stock changes.
[5]Primary refined production + copper from old and new scrap + refined imports – refined exports ± adjustments for refined copper stock changes.
[6]See Appendix C for resource and reserve definitions and information concerning data sources.
[7]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 27 million tons.
[8]Source: Hammarstrom, J.M., Zientek, M.L., Parks, H.L., Dicken, C.L., and the U.S. Geological Survey Global Copper Mineral Resource Assessment Team, 2019, Assessment of undiscovered copper resources of the world, 2015 (ver. 1.2, December 2021): U.S. Geological Survey Scientific Investigations Report 2018–5160, 619 p. (Accessed November 24, 2025, at https://doi.org/10.3133/sir20185160.)

DIAMOND (INDUSTRIAL)[1]

(Data in million carats unless otherwise specified)

Domestic Production and Use: In 2025, total domestic primary production of manufactured industrial diamond bort, grit, and dust and powder was estimated to be 160 million carats with a value of $52 million, compared with 159 million carats with a value of $52 million in 2024. No industrial diamond stone was produced domestically. One company with facilities in Florida and Ohio and a second company in Pennsylvania accounted for all domestic primary production. At least four companies produced polycrystalline diamond from diamond powder. At least two companies recovered used industrial diamond material from used diamond drill bits, diamond tools, and other diamond-containing wastes for recycling. The major consuming sectors of industrial diamond are computer chip production; construction; drilling for minerals, natural gas, and oil; machinery manufacturing; stone cutting and polishing; and transportation (infrastructure and vehicles). Highway building, milling, and repair and stone cutting consumed most of the industrial diamond stone. About 97% of U.S. industrial diamond apparent consumption was synthetic industrial diamond because its quality can be controlled, and its properties can be customized.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Bort, grit, and dust and powder; natural and synthetic:					
Production:					
Manufactured diamond[e]	132	150	152	159	160
Secondary	1.20	14.4	14.0	14.9	15
Imports for consumption	261	303	264	238	170
Exports	99.1	94.0	74.0	73.3	72
Consumption, apparent[2]	294	374	356	334	270
Price, unit value of imports, dollars per carat	0.18	0.19	0.16	0.19	0.21
Net import reliance[3] as a percentage of apparent consumption	55	56	53	49	35
Stones, natural and synthetic:					
Production:					
Manufactured diamond[e]	—	—	—	—	—
Secondary	0.08	0.08	0.08	0.08	0.08
Imports for consumption	0.33	0.79	0.38	0.39	0.35
Exports	—	([4])	([4])	([4])	([4])
Consumption, apparent[2]	0.41	0.86	0.45	0.46	0.43
Price, unit value of imports, dollars per carat	13.00	8.40	14.20	11.30	6.70
Net import reliance[3] as a percentage of apparent consumption	80	91	83	84	81

Recycling: In 2025, the amount of diamond bort, grit, and dust and powder recycled was estimated to be 15 million carats with an estimated value of $540,000. An estimated 75,000 carats of diamond stone was recycled with an estimated value of $110,000.

Import Sources (2021–24): Bort, grit, and dust and powder; natural and synthetic: China,[5] 77%; Republic of Korea, 8%; Ireland, 5%; and other, 10%. Stones, primarily natural: India, 49%; South Africa, 26%; Russia, 8%; Botswana, 5%; and other, 12%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Industrial Miners' diamonds:		
Carbonados	7102.21.1010	Free.
Other	7102.21.1020	Free.
Industrial diamonds:		
Simply sawn, cleaved, or bruted	7102.21.3000	Free.
Not worked	7102.21.4000	Free.
Grit or dust and powder of natural diamonds:		
80 mesh or finer	7105.10.0011	Free.
Over 80 mesh	7105.10.0015	Free.
Grit or dust and powder of synthetic diamonds:		
Coated with metal	7105.10.0020	Free.
Not coated with metal, 80 mesh or finer	7105.10.0030	Free.
Not coated with metal, over 80 mesh	7105.10.0050	Free.

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DIAMOND (INDUSTRIAL)

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Most natural industrial diamond is produced as a byproduct of mining gem-quality diamond. Global natural industrial diamond production was essentially the same in 2025 as in 2024. Russia, the leading country in the production of natural industrial diamond, produced 16 million carats or 42% of total world production, followed by Congo (Kinshasa), 7 million carats (18%); Botswana, 5 million carats (14%); Zimbabwe, 5 million carats (13%); and South Africa, 3 million carats (8%). These five countries produced 95% of the world's natural industrial diamond. In recent years, mines have closed, and output has been lower as mines approach the ends of their lives. The world's largest diamond mines have matured and are past their peak production levels, and several of the largest diamond mines are expected to close in the near future. As these mines are depleted, global production is expected to continue declining in quantity.

In 2025, U.S. synthetic-industrial-diamond producers did not manufacture any diamond stone. The combined apparent consumption of all types of industrial diamond decreased by about 20% in quantity and by 17% in value from that in 2024. During 2025, imports of all types of natural and synthetic industrial diamond imports decreased by 30% from that in 2024. In 2025, China was the leading producing country of synthetic industrial diamond, followed by the United States and Russia, in descending order of quantity. These three countries produced about 99% of the world's synthetic industrial diamond. Synthetic diamond accounted for more than 99% of global industrial diamond production and consumption. Worldwide production of manufactured industrial diamond totaled more than 15 billion carats.

The United States is likely to continue to be one of the world's leading markets for industrial diamond into the next decade and is expected to remain a significant producer of synthetic industrial diamond as well. U.S. demand for industrial diamond is likely to be strong in the construction sector as the United States continues building, milling, and repairing the Nation's highway system. Industrial diamond is impregnated in or coats the cutting edge of saws used to cut concrete in highway construction and repair work.

World Natural Industrial Diamond Mine Production and Reserves: Reserves for Russia, South Africa, and Zimbabwe were revised based on company and Government reports.

	Mine production		Reserves[6]
	2024	2025[e]	
United States	—	—	NA
Angola	1	1	150
Botswana	5	5	250
Congo (Kinshasa)	7	7	150
Russia	16	16	750
South Africa	3	3	87
Zimbabwe	5	5	56
Other countries	1	1	250
World total (rounded)	38	38	1,700

World Resources:[6] Natural diamond deposits have been discovered in more than 35 countries. Natural diamond accounts for less than 1% of all industrial diamond used; synthetic diamond accounts for the remainder. At least 15 countries have the technology to produce synthetic diamond.

Substitutes: Materials that can compete with industrial diamond in some applications include manufactured abrasives such as cubic boron nitride, fused aluminum oxide, and silicon carbide. Globally, synthetic diamond, rather than natural diamond, is used for more than 99% of industrial applications.

[e]Estimated. NA Not available. — Zero.

[1]See the Gemstones chapter for information on gem-quality diamond.

[2]Defined as manufactured diamond production + secondary diamond production + imports – exports.

[3]Defined as imports – exports.

[4]Less than 500 carats.

[5]Includes Hong Kong.

[6]See Appendix C for resource and reserve definitions and information concerning data sources.

DIATOMITE

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: In 2025, production of diatomite, also known as diatomaceous earth, was estimated to be 720,000 tons with an estimated processed value of $420 million, free on board (f.o.b.) plant. Six companies produced diatomite at 13 mining areas and 9 processing facilities in California, Nevada, Oregon, and Washington. Approximately 60% of diatomite was used in filtration products. The remaining 40% was used in absorbents, lightweight aggregates, fillers, and other applications. A small amount, less than 1%, was used for specialized pharmaceutical and biomedical purposes. The unit value of diatomite varied widely in 2025, from approximately $10 per metric ton when used as a lightweight aggregate in portland cement concrete to more than $1,000 per metric ton for limited specialty markets, including art supplies, cosmetics, and deoxyribonucleic acid (DNA) extraction. The price for diatomite used for filtration was approximately $580 per metric ton.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production[1]	998	827	849	721	720
Imports for consumption	14	14	12	14	13
Exports	69	64	54	64	58
Consumption, apparent[2]	943	777	807	671	680
Price, average value, f.o.b. plant, dollars per metric ton	410	416	580	575	580
Employment, mine and plant, number[e]	370	370	370	370	370
Net import reliance[3] as a percentage of apparent consumption	E	E	E	E	E

Recycling: None.

Import Sources (2021–24): Canada, 55%; Mexico, 17%; Germany, 11%; Argentina, 6%; and other, 11%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Siliceous fossil meals, including diatomite	2512.00.0000	Free.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: The amount of domestically produced diatomite sold or used by producers in 2025 was estimated to be 720,000 tons, compared with 721,000 tons in 2024. Apparent consumption in 2025 was an estimated 675,000 tons, compared with 671,000 tons in 2024. Imports were estimated to have decreased by 7% compared with those in 2024. Exports were estimated to have decreased by 9% compared with those in 2024. The United States remained the leading global producer and consumer of diatomite. Filtration (including the cleansing of greases and oils and the purification of beer, liquors, water, and wine) continued to be the leading end use for diatomite. An important application for diatomite is the removal of microbial contaminants, such as bacteria, protozoa, and viruses in public water systems. Diatomite continued to be widely used as an inert carrier for pesticides and as an anticaking agent in animal feeds. Caution in the processing and use of diatomite was suggested because many forms contain crystalline silica, which is known to cause cancer, birth defects, or other reproductive harm to humans when exposed to levels above permissible limits.

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DIATOMITE

In 2025, the United States accounted for an estimated 29% of total world production, followed by Denmark with 15%, France with 10%, Argentina with 8%, and China and Turkey, each with 6%. Smaller quantities of diatomite were mined in 22 additional countries. World production of diatomite in 2025 was estimated to be 2.5 million tons, compared with 2.53 million tons in 2024.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Argentina, China, Denmark, the Republic of Korea, Turkey, and the United States based on company and Government reports.

	Mine production[e]		Reserves[4]
	2024	2025	
United States[1]	[6]721	720	250,000
Argentina	185	190	NA
China	140	140	120,000
Denmark (processed)[5]	380	380	NA
France	250	250	NA
Germany	50	50	NA
Japan	40	40	NA
Korea, Republic of	120	120	2,200
Mexico	100	100	NA
New Zealand	40	40	NA
Peru	99	99	NA
Russia	50	50	NA
Spain	50	50	57,000
Turkey	150	150	44,000
Other countries	152	160	NA
World total (rounded)	2,530	2,500	Large

World Resources:[4] Diatomite deposits form from an accumulation of amorphous hydrous silica cell walls of dead diatoms in oceanic and fresh waters. Diatomite is also known as kieselguhr (Germany), moler (an impure Danish form), and tripolite (after an occurrence near Tripoli, Libya). Because U.S. diatomite occurrences are at or near Earth's surface, recovery from most deposits is achieved through low-cost, open pit mining. Outside the United States, however, underground mining is fairly common owing to deposit location and topographic constraints. World resources of crude diatomite are adequate for the foreseeable future.

Substitutes: Many materials can be substituted for diatomite. However, the unique properties of diatomite assure its continued use in many applications. Expanded perlite and silica sand compete for filtration. Filters made from manufactured materials, notably ceramic, polymeric, or carbon membranes and filters made with cellulose fibers are becoming competitive as filter media. Alternate filler materials include clay, ground limestone, ground mica, ground silica sand, perlite, talc, and vermiculite. For thermal insulation, materials such as special brick, various clays, expanded perlite, exfoliated vermiculite, and mineral wool can be used. Transportation costs will continue to determine the maximum economic distance that most forms of diatomite may be shipped and still remain competitive with alternative materials.

[e]Estimated. E Net exporter. NA Not available.
[1]Processed ore sold or used by producers.
[2]Defined as production + imports – exports.
[3]Defined as imports – exports.
[4]See Appendix C for resource and reserve definitions and information concerning data sources.
[5]Includes sales of moler production.
[6]Reported.

FELDSPAR AND NEPHELINE SYENITE

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: In 2025, the quantity of domestic feldspar production was estimated to be 440,000 tons with a value of $49 million. Feldspar was mined by six companies operating eight mines and beneficiating facilities: four in North Carolina, two in California, and one each in Idaho and Virginia. In addition to feldspar, processors reported recovery of mica and silica sand. Two companies produced nepheline syenite in Arkansas, but production data were not available.

Feldspar is ground to about 20 mesh for glassmaking and to 200 mesh or finer for most ceramic and filler applications. In glass and pottery, feldspar and nepheline syenite function as a flux. Ceramics, pottery, and miscellaneous applications accounted for 53% of end-use distribution of domestic feldspar, and glass manufacturing including fiberglass for home insulation, flat glass, glass containers, and specialty glass accounted for the remaining 47%.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production, feldspar, marketable[1]	430	440	460	450	440
Imports for consumption:					
Feldspar	169	276	68	153	100
Nepheline syenite	529	484	440	456	420
Exports:					
Feldspar	4	3	7	5	2
Consumption, apparent:[1, 2]					
Feldspar	590	710	520	590	540
Feldspar and nepheline syenite[3]	1,100	1,200	960	1,000	960
Price, average unit value, dollars per metric ton:					
Feldspar only, marketable production[e]	107	107	107	108	110
Nepheline syenite, imports	164	183	195	198	220
Employment, mine, preparation plant, and office, number[e]	180	150	160	160	160
Net import reliance[4] as a percentage of apparent consumption:					
Feldspar	28	38	12	25	18
Nepheline syenite	>95	>95	>95	>95	>95

Recycling: Feldspar and nepheline syenite are not recycled by producers; however, glass container producers use cullet (recycled container glass), thereby reducing feldspar and nepheline syenite consumption.

Import Sources (2021–24): Feldspar: Turkey, 93%; Mexico, 5%; and other, 2%. Nepheline syenite: Canada, 99%; and other, 1%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Feldspar	2529.10.0000	Free.
Nepheline syenite	2529.30.0010	Free.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: In 2025, estimated domestic production and sales of feldspar decreased slightly compared with those in 2024, and the average unit value increased slightly compared with that in 2024. Estimated imports of feldspar decreased by 35% and imports of nepheline syenite decreased by 8% compared with those in 2024.

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FELDSPAR AND NEPHELINE SYENITE

In the United States, new residential construction housing starts, for which feldspar is a raw material commonly used in the manufacture of plate glass, ceramic tiles and sanitaryware, and insulation, increased slightly during the first 8 months of 2025 compared with the same period in 2024. Market trends continue to shift toward alternatives to plastic, leading to greater adoption of glass packaging. Companies have launched initiatives to reduce plastic use and promote glass containers among consumers. These developments in both the construction and packaging sectors are expected to continue driving the demand for feldspar-based products.

The leading feldspar-producing countries, which accounted for 74% of the world production, listed in descending order of estimated production, were India, Turkey, Iran, China, Italy, and Thailand.

World Mine Production and Reserves:[5] Significant revisions were made to the 2024 production for Brazil, China, Iran, Morrocco, Spain, and Turkey based on company and Government reports.

	Mine production[e]		Reserves[6]
	2024	2025	
United States[1]	450	440	NA
Brazil (beneficiated, marketable)	620	620	150,000
China	3,700	3,700	730,000
India	6,000	6,000	320,000
Iran	3,900	3,900	130,000
Italy	2,200	2,200	NA
Korea, Republic of	990	1,000	200,000
Morocco	720	720	NA
Russia	650	650	NA
Saudi Arabia	650	650	NA
Spain (includes pegmatites)	620	620	NA
Thailand	1,900	1,900	45,000
Turkey	[7]5,274	5,300	720,000
Other countries	3,400	3,400	NA
World total (rounded)	31,100	31,000	Large

World Resources:[6] Identified and undiscovered resources of feldspar are more than adequate to meet anticipated world demand. Quantitative data on resources of feldspar existing in feldspathic sands, granites, and pegmatites generally have not been compiled. Ample geologic evidence indicates that resources are large, although not always conveniently accessible to the principal centers of consumption.

Substitutes: Imported nepheline syenite was the major alternative material for feldspar. Feldspar can be replaced in some of its end uses by clays, electric furnace slag, feldspar-silica mixtures, pyrophyllite, spodumene, or talc.

[e]Estimated. NA Not available.
[1]Rounded to two significant digits to avoid disclosing company proprietary data.
[2]Defined as production + imports – exports.
[3]Includes feldspar and imported nepheline syenite: excludes nepheline syenite exports.
[4]Defined as imports – exports.
[5]Feldspar only.
[6]See Appendix C for resource and reserve definitions and information concerning data sources.
[7]Reported.

FLUORSPAR

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: Significant U.S. fluorspar (calcium fluoride, CaF_2) mine production has not been reported since 1995. In 2025, one company likely processed and sold fluorspar from stockpiles produced as a byproduct of its limestone quarrying operation in Cave-In-Rock, IL; however, production data were not available. A second company continued construction of a fluorspar mine and lumps-processing plant in Utah, with completion anticipated by yearend. Excluding sales from stockpiled fluorspar, the United States was 100% net import reliant for fluorspar. U.S. fluorspar consumption was satisfied mostly by imports. Domestically, CaF_2 was used in the production of anhydrous hydrogen fluoride (HF) in Louisiana and Texas and was by far the leading use for acid-grade fluorspar. Aqueous HF is the primary feedstock for the manufacture of virtually all fluorine-bearing chemicals, particularly refrigerants and fluoropolymers, and chemicals used in the processing of primary aluminum and uranium. HF was also used as a catalyst in the petrochemical industry and essential in the cleaning and etching process during semiconductor manufacturing. Other uses of fluorspar were in cement production, in enamels, as a flux in steelmaking, in glass manufacture, in iron and steel casting, and in welding rod coatings.

The U.S. Department of Energy continued to produce aqueous HF as a byproduct of the conversion of depleted uranium hexafluoride to depleted uranium oxide at plants in Paducah, KY, and Portsmouth, OH; the aqueous HF was sold into the commercial market. One company in Aurora, NC, produced HF from fluorosilicic acid (FSA). In 2025, an estimated 45,000 tons of FSA, equivalent to about 73,000 tons of fluorspar grading 100% CaF_2, was recovered from three phosphoric acid plants that processed phosphate rock.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production:					
Finished, metallurgical grade	NA	NA	NA	NA	NA
Fluorosilicic acid from phosphate rock	40	43	43	45	45
Imports for consumption:					
Acid grade	391	448	378	372	360
Metallurgical grade	59	84	34	31	20
Total fluorspar imports	451	532	412	403	380
Hydrofluoric acid	103	99	87	69	76
Aluminum fluoride	28	21	25	22	20
Cryolite	42	28	32	22	21
Exports, fluorspar, all grades[1]	15	24	20	14	7
Consumption, apparent[2]	436	508	392	390	370
Price, average unit value of imports, cost, insurance, and freight, dollars per metric ton:					
Acid grade	322	387	428	464	470
Metallurgical grade	151	206	338	336	400
Employment, mine, number[e]	17	15	16	15	15
Net import reliance[2] as a percentage of apparent consumption	100	100	100	100	100

Recycling: Synthetic fluorspar may be produced from neutralization of waste in the enrichment of uranium, petroleum alkylation, and stainless-steel pickling; however, undesirable impurities constrain its use. Primary aluminum producers recycle HF and fluorides from smelting operations.

Import Sources (2021–24):[3] Mexico, 64%; Vietnam, 12%; China,[4] 10%; South Africa, 9%; and other, 5%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Metallurgical grade (97% or less CaF_2)	2529.21.0000	Free.
Acid grade (more than 97% CaF_2)	2529.22.0000	Free.
Natural cryolite	2530.90.1000	Free.
Hydrogen fluoride (hydrofluoric acid)	2811.11.0000	Free.
Aluminum fluoride	2826.12.0000	Free.
Sodium hexafluoroaluminate (synthetic cryolite)	2826.30.0000	Free.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile: None.

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FLUORSPAR

Events, Trends, and Issues: Global mine production of fluorspar was estimated to have decreased by 1% to 10 million tons in 2025. The supply of fluorspar in China continued to be constrained by rectification measures on fluorspar mining, with some mines suspending production for safety inspections. As such, China's imports of fluorspar in the first half of 2025 increased by 48% to 856,000 tons compared with those in the same period in 2024, with 86% of imports sourced from Mongolia.

In Canada, a fluorspar mine that was previously idled in 2022, restarted production and made its first shipment of acid-grade fluorspar at the end of August. The company anticipated ramping up production to 200,000 tons per year. In China, a fluorspar mine in Xinjiang began operations in September, with a projected annual production of 300,000 tons of acid-grade fluorspar. Several other fluorspar mines were in development or in the process of reopening in Australia, Canada, Germany, Italy, Kenya, Mongolia, Mozambique, and the United States.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Germany, Iran, Mexico, Mongolia, South Africa, and Vietnam based on company and Government reports. Reserves for China were revised based on Government reports.

	Mine production[e]		Reserves[5]
	2024	2025	
United States	NA	NA	NA
Brazil	85	100	2,500
China	6,000	6,000	110,000
Germany	35	35	NA
Iran	53	70	7,600
Mexico	[6]1,510	1,500	68,000
Mongolia	1,430	1,500	34,000
Pakistan	60	50	NA
South Africa	447	410	41,000
Spain	138	140	15,000
Tajikistan	15	15	NA
Thailand	75	55	3,600
Vietnam	146	160	16,000
Other countries	316	200	32,000
World total (rounded)	10,300	10,000	330,000

World Resources:[5, 7] Large quantities of fluorine are present in phosphate rock. Current U.S. reserves of phosphate rock are estimated to be 1 billion tons, containing about 72 million tons of 100% fluorspar equivalent assuming an average fluorine content of 3.5% in the phosphate rock. World reserves of phosphate rock are estimated to be 74 billion tons, containing about 5 billion tons of 100% fluorspar equivalent.

Substitutes: FSA has been used as an alternative to fluorspar in the production of AlF_3 and HF. Aluminum smelting dross, borax, calcium chloride, iron oxides, manganese ore, silica sand, and titanium dioxide have been used as substitutes for fluorspar fluxes.

[e]Estimated. NA Not available.
[1]Includes data for the following Schedule B numbers: 2529.21.0000 and 2529.22.0000.
[2]Defined as total fluorspar imports – exports.
[3]Includes data for the following Harmonized Tariff Schedule of the United States codes: 2529.21.0000 and 2529.22.0000.
[4]Includes Hong Kong.
[5]See Appendix C for resource and reserve definitions and information concerning data sources.
[6]Reported.
[7]Measured as 100% CaF_2.

GALLIUM

(Data in kilograms, gallium content, unless otherwise specified)

Domestic Production and Use: No domestic primary (low-purity, unrefined) gallium has been recovered since 1987. Globally, primary gallium is recovered predominantly as a byproduct of processing bauxite ores. Gallium may also be recovered as a byproduct of processing zinc ores. One company in New York recovered and refined high-purity gallium from imported primary low-purity gallium metal and new scrap. In 2025, the value of imports of gallium metal was an estimated $15 million, and the value of gallium arsenide (GaAs) wafer imports was an estimated $120 million. GaAs was used to manufacture compound semiconductor wafers used in integrated circuits (ICs) and optoelectronic devices, which include laser diodes, light-emitting diodes (LEDs), photodetectors, and solar cells. Gallium nitride (GaN) was used to manufacture ICs and optoelectronic devices; ICs accounted for 73% of domestic gallium consumption, and optoelectronic devices accounted for 26%. Optoelectronic devices were used in aerospace applications, consumer goods, industrial equipment, medical equipment, and telecommunications equipment. Uses of ICs included defense applications, high-performance computers, and telecommunications equipment.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production, primary	—	—	—	—	—
Imports for consumption:					
Metal	8,890	11,400	11,400	11,000	25,000
Gallium arsenide wafers (gross weight)	306,000	424,000	163,000	152,000	110,000
Exports	NA	NA	NA	NA	NA
Consumption, reported[1]	17,100	19,700	17,800	18,700	19,000
Price, average unit value of imports, dollars per kilogram[2]	277	432	365	439	580
Stocks, consumer, yearend[1]	2,810	2,780	3,340	3,410	3,400
Net import reliance[3] as a percentage of reported consumption	100	100	100	100	100

Recycling: Old scrap, none. Substantial quantities of new scrap generated in the manufacture of GaAs-based devices were reprocessed to recover high-purity gallium at one facility in New York.

Import Sources (2021–24): Metal: Canada, 28%; Japan, 22%; China, 18%; Germany, 16%; and other, 16%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Gallium arsenide wafers, undoped	2853.90.9010	2.8% ad valorem.
Gallium arsenide wafers, doped	3818.00.0010	Free.
Gallium metal	8112.92.1000	3% ad valorem.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: Not available.

Events, Trends, and Issues: Imports of gallium metal, GaAs wafers, and domestic production of GaAs and GaN wafers continued to account for all U.S. consumption of gallium. In 2025, imports of gallium metal were estimated to be more than double those in 2024, and the average unit value of imported gallium metal was estimated to be $580 per kilogram, about 30% more than that in 2024. Imports of gallium arsenide wafers were estimated to be 24% less than those in 2024. In November 2025, China lifted its ban on gallium exports to the United States for 1 year. This followed the Government of China's gallium export controls implemented in August 2023 and China's ban of all gallium exports to the United States in December 2024.

China accounted for 99% of worldwide primary low-purity gallium production. The remaining primary low-purity gallium producers outside of China included Japan and Russia. Germany, Hungary, and Kazakhstan ceased primary production in 2016, 2015, and 2013, respectively. Ukraine most likely ceased primary production in 2022. Several new gallium production projects were announced including those in Australia, Canada, Greece, Kazakhstan, and the Republic of Korea.

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GALLIUM

In September, the U.S. Department of Energy announced as much as $6 million in funding for domestic research and development projects to help establish a domestic supply chain for gallium. This initiative was expected to be used to support technologies to recover gallium from alumina refining or primary zinc smelting with the goal of restarting domestic primary gallium recovery for the first time in almost 40 years.

In November, the U.S. Department of War, under the Defense Production Act, Title III, granted a $29.9 million award to a U.S. company to develop a demonstration facility in Louisiana that will recover gallium and scandium from industrial waste. Initial development work was expected to take place at a facility in Texas.

World Low-Purity Production and Production Capacity:

	Primary production		Production capacity
	2024	2025[e]	2025
United States	—	—	—
China	[4]839,000	[5]900,000	[5]1,600,000
Japan[e]	3,000	3,000	10,000
Russia[e]	6,000	6,000	10,000
Other countries[6]	—	—	[e]100,000
World total (rounded)	848,000	900,000	[e]1,700,000

World Resources:[7] Gallium occurs in very small concentrations in ores of other metals. Most gallium is produced as a byproduct of processing bauxite, and the remainder is produced from zinc-processing residues. The average gallium content of bauxite is 50 parts per million. U.S. bauxite deposits consist mainly of subeconomic resources that are not generally suitable for alumina production owing to their high silica content. Some domestic zinc ores contain up to 50 parts per million gallium and could be a significant resource, although no gallium is currently recovered from domestic ores. Gallium contained in world resources of bauxite is estimated to exceed 1 million tons.

Substitutes: Liquid crystals made from organic compounds are used in visual displays as substitutes for LEDs. Silicon-based complementary metal-oxide semiconductor power amplifiers compete with GaAs power amplifiers in midtier third-generation (3G) cellular handsets. Indium phosphide components can be substituted for GaAs-based infrared laser diodes in some specific-wavelength applications, and helium-neon lasers compete with GaAs in visible laser diode applications. Silicon is the principal competitor with GaAs in solar-cell applications. In many defense-related applications, GaAs- and GaN-based ICs are used because of their unique properties, and no effective substitutes exist for GaAs and GaN in these applications. In heterojunction bipolar transistors, GaAs is being replaced in some applications by silicon-germanium.

[e]Estimated. NA Not available. — Zero.
[1]Includes U.S. Geological Survey estimates.
[2]Source: U.S. Census Bureau. Average customs value of U.S. imports of gallium metal, Harmonized Tariff Schedule of the United States code 8112.92.1000.
[3]Defined as imports – exports. Excludes gallium arsenide wafers.
[4]Source: Asian Metal Ltd.
[5]Estimated from Asian Metal Ltd.
[6]Other countries estimated to still have primary low-purity gallium production capacity include Germany, Hungary, Kazakhstan, the Republic of Korea, and Ukraine.
[7]See Appendix C for resource and reserve definitions and information concerning data sources.

GARNET (INDUSTRIAL)[1]

(Data in metric tons unless otherwise specified)

Domestic Production and Use: In 2025, garnet for industrial use was mined by three companies—one in Montana and two in New York. One processing facility operated in Oregon and another operated in Pennsylvania. The estimated value of crude garnet production was $17 million, and refined material sold or used had an estimated value of $50 million. The major end uses of garnet were, in descending percentage of consumption, for abrasive blasting, water-filtration media, water-jet-assisted cutting, and other end uses, such as in abrasive powders, nonslip coatings, and sandpaper. Domestic industries that consume garnet include aircraft and motor vehicle manufacturers, ceramics and glass producers, electronic component manufacturers, filtration plants, glass polishing, the petroleum industry, shipbuilders, textile stonewashing, and wood-furniture-finishing operations.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production:					
Crude	81,700	76,400	71,900	74,200	77,000
Refined, sold or used	155,000	172,000	168,000	146,000	150,000
Imports for consumption[2]	145,000	268,000	151,000	155,000	210,000
Exports	20,400	23,300	20,000	24,400	22,000
Consumption, apparent[3]	206,000	321,000	203,000	204,000	270,000
Price, average import unit value, dollars per metric ton	280	194	211	270	170
Employment, mine and mill, number[e]	163	171	175	165	160
Net import reliance[4] as a percentage of apparent consumption	60	76	65	64	71

Recycling: Garnet was recycled at a plant in Oregon with a recycling capacity of 16,000 tons per year and at a plant in Pennsylvania with a recycling capacity of 25,000 tons per year. Garnet can be recycled multiple times without significant degradation of its quality. Most recycled garnet is from blast cleaning and water-jet-assisted cutting operations.

Import Sources (2021–24):[e] South Africa, 59%; Australia, 21%; China,[5] 9%; India, 8%; and other, 3%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Emery, natural corundum, natural garnet, and other natural abrasives:		
Crude	2513.20.1000	Free.
Other than crude	2513.20.9000	Free.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: During 2025, estimated domestic production of crude garnet concentrates increased by 4% compared with production in 2024. U.S. garnet production was estimated to be 9% of total estimated global garnet production. The 2025 estimated domestic amount of refined garnet sold or used was 150,000 tons compared with 146,000 tons sold or used in 2024.

Garnet imports in 2025 were estimated to have increased by 37% compared with those in 2024. This increase was attributed to large increases in garnet imports from South Africa. South Africa's garnet mine suspended operations in November 2024 because of escalating debts. The imports from South Africa likely came from stocks that were previously mined. In 2025, the average unit value of garnet imports was $170 per ton, a 39% decrease compared with the average unit value in 2024. In the United States, the average price of domestically produced crude garnet concentrate was about $220 per ton. U.S. exports in 2025 were estimated to have decreased by 10%. During 2025, the United States consumed an estimated 270,000 tons of garnet, a 31% increase from that in 2024.

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GARNET (INDUSTRIAL)

The U.S. natural gas and petroleum industry is one of the leading garnet-consuming industries, using garnet for cleaning drill pipes and well casings. Natural gas and petroleum producers also use garnet as a reservoir-fracturing proppant, alone or mixed with other proppants. During 2024, the average number of drill rigs operating in the United States was 599.[6] By the end of the first week of November 2025, the average number of rigs operating had declined to 564,[6] a decrease of 6%. This indicates that less garnet was consumed in well drilling in 2025 than in 2024.

The garnet market is very competitive. To increase profitability and remain competitive with imported material, production may be restricted to only high-grade garnet ores or as a byproduct of other salable mineral products that occur with garnet, such as kyanite, marble, metallic ore minerals, mica minerals, sillimanite, staurolite, or wollastonite.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for China and South Africa based on company and Government reports. Reserves for South Africa were revised based on company and Government reports.

	Mine production[e]		Reserves[7]
	2024	2025	
United States	74,200	77,000	5,000,000
Australia	[8]348,000	350,000	Moderate to large
China	[8]250,000	280,000	37,000,000
Czechia	4,000	4,000	NA
India	15,000	15,000	8,600,000
Pakistan	1,900	1,900	NA
South Africa	[8]40,000	—	1,300,000
World total (rounded)	734,000	730,000	Moderate to large

World Resources:[7] World resources of garnet are large and occur in a wide variety of rocks, particularly gneisses and schists. Garnet also occurs in contact-metamorphic deposits in crystalline limestones, pegmatites, and serpentinites and in vein deposits. In addition, alluvial garnet is present in many heavy-mineral sand and gravel deposits throughout the world. Large domestic resources of garnet also are concentrated in coarsely crystalline gneiss near North Creek, NY; other significant domestic resources of garnet occur in Idaho, Maine, Montana, New Hampshire, North Carolina, and Oregon. In addition to those in the United States, major garnet deposits exist in Australia, China, Czechia, India, Pakistan, and South Africa, where they are mined for foreign and domestic markets. Deposits in Russia and Turkey also have been mined primarily for internal markets but production data were not reported. Additional garnet resources are in Canada, Chile, Spain, Thailand, and Ukraine; small mining operations have been reported in most of these countries, but available information was inadequate to make reliable estimates of their individual output.

Substitutes: Other natural and manufactured abrasives can substitute to some extent for all major end uses of garnet. In many cases, however, using the substitutes would entail increased cost or decreased quality. Fused aluminum oxide and staurolite compete with garnet as a sandblasting material. Ilmenite, magnetite, and plastics compete as filtration media. Corundum, diamond, and fused aluminum oxide compete for lens grinding and for many lapping operations. Emery is a substitute in nonskid surfaces. Fused aluminum oxide, quartz sand, and silicon carbide compete for the finishing of plastics, wood furniture, and other products.

[e]Estimated. NA Not available. — Zero.
[1]Excludes gem and synthetic garnet. All percentages are calculated using unrounded data.
[2]Sources: U.S. Census Bureau and Trade Mining, LLC; data adjusted by the U.S. Geological Survey to represent only the garnet portion of the materials under the HTS codes.
[3]Defined as crude production + imports – exports.
[4]Defined as imports – exports.
[5]Includes Hong Kong.
[6]Source: Baker Hughes Co., 2025, 11-07-2025 North America rig count report: Baker Hughes Co. (Accessed November 11, 2025, at https://bakerhughesrigcount.gcs-web.com/na-rig-count.)
[7]See Appendix C for resource and reserve definitions and information concerning data sources.
[8]Reported.

GEMSTONES[1]

(Data in million dollars unless otherwise specified)

Domestic Production and Use: The combined value of U.S. natural and synthetic gemstone output in 2025 was an estimated $47 million, a decrease of 30% compared with that in 2024. Domestic natural gemstone production included agate, beryl, coral, diamond, garnet, jade, jasper, opal, pearl, quartz, sapphire, shell, topaz, tourmaline, turquoise, and many other gem materials. In descending order of production value, Arizona led the Nation in natural gemstone production, followed by Oregon, California, Nevada, Montana, and Maine. These six States accounted for 68% of the natural gemstone production in the United States. Synthetic gemstones were manufactured by five companies in North Carolina, California, Oregon, South Carolina, and Arizona, in descending order of production value. U.S. synthetic gemstone production decreased by 35% compared with that in 2024. Major gemstone end uses were carvings, gem and mineral collections, and jewelry.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production:[2]					
Natural[3]	9.48	9.95	10.0	9.25	9.4
Laboratory-created (synthetic)	79.3	87.1	64.6	56.8	37
Imports for consumption	24,600	28,700	24,200	19,600	11,000
Exports, excluding reexports	992	1,890	3,610	2,110	1,700
Consumption, apparent[4]	23,700	26,900	21,300	17,600	9,300
Price	Variable, depending on size, type, and quality				
Employment, mine, number[e]	1,100	1,100	1,100	1,100	1,100
Net import reliance[5] as a percentage of apparent consumption	99	99	99	99	99

Recycling: Gemstones are often recycled as estate jewelry, reset, or recut, but this report does not account for those resales.

Import Sources (2021–24, by value): Diamond: India, 46%; Israel, 27%; Belgium, 11%; South Africa, 4%; and other, 12%. Diamond imports accounted for an average of 79% of the total value of gem imports in 2025.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Coral and similar materials, unworked	0508.00.0000	Free.
Imitation gemstones	3926.90.4000	2.8% ad valorem.
Imitation pearls and imitation pearl beads, not strung	7018.10.1000	4% ad valorem.
Imitation gemstones	7018.10.2000	Free.
Pearls, natural, graded and temporarily strung	7101.10.3000	Free.
Pearls, natural, other	7101.10.6000	Free.
Pearls, cultured	7101.21.0000	Free.
Diamonds, unworked or sawn	7102.31.0000	Free.
Diamonds, cut, 0.5 carat or less	7102.39.0010	Free.
Diamonds, cut, more than 0.5 carat	7102.39.0050	Free.
Other nondiamond gemstones, unworked	7103.10.2000	Free.
Other nondiamond gemstones, uncut	7103.10.4000	10.5% ad valorem.
Rubies, cut	7103.91.0010	Free.
Sapphires, cut	7103.91.0020	Free.
Emeralds, cut	7103.91.0030	Free.
Other nondiamond gemstones, cut	7103.99.1000	Free.
Other nondiamond gemstones, worked	7103.99.5000	10.5% ad valorem.
Synthetic diamonds, unworked or roughly shaped	7104.21.0000	3% ad valorem.
Synthetic gemstones, unworked or roughly shaped	7104.29.0000	3% ad valorem.
Synthetic diamonds, cut but not set	7104.91.1000	Free.
Synthetic diamonds, other	7104.91.5000	6.4% ad valorem.
Synthetic gemstones, worked or cut but not set	7104.99.1000	Free.
Synthetic gemstones, other	7104.99.5000	6.4% ad valorem.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

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GEMSTONES

Events, Trends, and Issues: Total world diamond production in 2025 was essentially unchanged from that in 2024. In 2025, Russia was the world's leading gem-grade diamond producer, with approximately 30% of total global production by volume. The United States was one of the world's leading markets for polished diamonds. During 2025, sanctions against Russia and the Russian state-owned diamond-mining company by the U.S. Government, the European Union, and the Group of Seven (representatives of the seven leading industrial nations) remained in effect. These sanctions prohibited the import of rough and finished gem-grade diamonds from Russia, including diamonds processed in third countries, to limit Russia's ability to fund its conflict with Ukraine.

The global natural diamond market continued the downturn that began in early 2023 and has especially affected the lower end (one carat or less) of the commercial segment. This downturn affected the entire diamond pipeline. Fewer jewelry sales led to a decline in trading of polished diamonds and a buildup of midstream inventory, which in turn led to a decline in diamond rough sales and lower prices, affecting the ability of mining companies to maintain operations. The slowdown resulted from decreased demand for luxury goods owing to global inflation, excess inventory, and increased popularity of less expensive synthetic diamonds.

In July 2025, a leading U.S. synthetic diamond company in Oregon ceased operations, which was a major reason for the 35% decrease in U.S. production. U.S. imports for consumption of gemstones during 2025 were valued at about $11 billion, which was a 44% decrease compared with $19.6 billion in 2024. The decrease in U.S. total gemstone imports combined with the value of domestic exports contributed to a 47% decrease in apparent consumption to a value of $9.4 billion in 2025 compared with $17.6 billion in 2024. The United States was one of the leading global markets in terms of sales and was expected to continue as a dominant global gemstone consumer.

World Gem-Quality Natural Diamond Mine Production and Reserves:[6] Significant revisions were made to the 2024 production for Angola, Botswana, Canada, Ghana, Lesotho, and Tanzania based on company and Government reports. Reserves for Russia, South Africa, and Zimbabwe were revised based on company and Government reports.

	Mine production		Reserves[7]
	2024	2025[e]	
United States	—	—	NA
Angola	12,600	13,000	150,000
Botswana	12,700	13,000	250,000
Canada	13,300	13,000	110,000
Congo (Kinshasa)	1,960	2,000	150,000
Ghana	333	330	NA
Lesotho	696	700	NA
Namibia	2,320	2,300	NA
Russia	20,900	21,000	750,000
Sierra Leone	459	460	NA
South Africa	2,140	2,100	87,000
Tanzania	318	320	NA
Zimbabwe	529	530	56,000
Other countries	324	320	120,000
World total (rounded)	68,600	69,000	>2,000,000

World Resources:[7] Most diamond ore bodies have a diamond content that ranges from less than 1 carat to about 6 carats per ton of ore. The major diamond reserves are in southern Africa, Australia, Canada, and Russia.

Substitutes: Glass, plastics, and other materials are substituted for natural gemstones. Synthetic gemstones (manufactured materials that have the same chemical and physical properties as natural gemstones) are common substitutes. Simulants (materials that appear to be gems but differ in chemical and physical characteristics) also are frequently substituted for natural gemstones.

[e]Estimated. NA Not available. — Zero.
[1]Excludes industrial diamond and industrial garnet. See the Diamond (Industrial) and Garnet (Industrial) chapters.
[2]Estimated minimum production.
[3]Includes production of freshwater shell.
[4]Defined as production (natural and synthetic) + imports (natural and synthetic) – exports (natural and synthetic, excluding reexports).
[5]Defined as imports (natural and synthetic) – exports (natural and synthetic, excluding reexports).
[6]Data in thousands of carats of natural diamond.
[7]See Appendix C for resource and reserve definitions and information concerning data sources.

GERMANIUM

(Data in kilograms, germanium content, unless otherwise specified)

Domestic Production and Use: In 2025, zinc concentrates containing germanium were produced at a mine in Alaska. Some of the germanium-containing concentrates produced in Alaska were exported to a refinery in Canada for processing and germanium recovery in the form of dioxide and tetrachloride. Operations at a mine in Tennessee that also produced germanium-containing zinc concentrates have been suspended since November 2023. Prior to the suspension, the zinc concentrates were sent to a zinc smelter in Clarksville, TN, which recovered the germanium in the form of an intermediate leach concentrate for export. The value of germanium metal and germanium dioxide (gross weight) imported domestically in 2025 was estimated to be $66 million. A company in St. George, UT, produced germanium wafers mostly for solar cells used in satellites from imported and recycled germanium. A company in Quapaw, OK, produced germanium tetrachloride for the production of fiber optics from imported and recycled germanium materials.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production, refinery:					
Primary	—	—	—	—	—
Secondary	NA	NA	NA	NA	NA
Imports for consumption:[e, 1]					
Germanium metal	13,000	14,000	22,000	21,000	7,000
Germanium dioxide	17,000	15,000	14,000	11,000	17,000
Germanium tetrachloride	NA	NA	NA	NA	NA
Exports:[e, 1]					
Germanium metal	5,500	6,600	6,000	9,000	7,000
Germanium dioxide	430	130	110	92	15
Germanium tetrachloride	NA	NA	NA	NA	NA
Shipments from Government stockpile[2]	—	—	NA	NA	NA
Consumption, estimated[3]	30,000	NA	NA	NA	NA
Price, annual average, dollars per kilogram:[4]					
Germanium metal	1,187	1,294	1,392	1,991	4,100
Germanium dioxide	770	828	883	1,281	2,500
Net import reliance[5] as a percentage of estimated consumption	>50	>50	>50	>50	>50

Recycling: The United States has the capability to recycle new (preconsumer) and old (postconsumer) germanium scrap. During the manufacture of infrared germanium optics, much of the germanium removed during the machining process is routinely recycled as new scrap. Infrared lenses and windows in decommissioned military equipment also are recycled to recover germanium. Germanium is recycled from certain wastes generated during the manufacture of optical fibers. Germanium wafers used as substrates to produce solar cells also are recycled. Available information was inadequate to make reliable estimates of the amount of secondary germanium produced.

Import Sources (2021–24):[1] Germanium metal: China, 41%; Belgium, 27%; Germany, 25%; Russia, 3%; and other, 4%. Germanium dioxide (Ge content): Belgium, 57%; Canada, 37%; Japan, 3%; and other, 3%. Combined total: Belgium, 41%; China, 23%; Canada, 17%; Germany, 14%; and other, 5%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Germanium dioxide	2825.60.0010	3.7% ad valorem.
Other germanium oxides	2825.60.0050	3.7% ad valorem.
Unspecified chlorides, including germanium tetrachloride	2827.39.9050	3.7% ad valorem.
Metal, unwrought	8112.92.6000	2.6% ad valorem.
Metal, powder	8112.92.6500	4.4% ad valorem.
Metal, wrought	8112.99.1000	4.4% ad valorem.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile:[6]

	FY 2025		FY 2026	
Material	Potential acquisitions	Potential disposals	Potential acquisitions	Potential disposals
Germanium (gross weight)	—	5,000	NA	NA

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GERMANIUM

Events, Trends, and Issues: The major end uses of germanium in the United States, in descending order, were fiber optics, infrared optics, semiconductor applications and solar cells, and radiation detectors. In the fiber optics industry, germanium dioxide and tetrachloride were consumed during the manufacture of fiber optic glass used for data networking and telecommunication. Germanium metal was processed into lenses for infrared optical systems used in commercial and government markets, fabricated into wafers used as substrates to produce multijunction solar cells used in space applications, and consumed to produce high-purity germanium radiation detectors. Germanium compounds were consumed to produce germane gas used in certain types of semiconductor and solar cell manufacturing. United States imports of germanium metal were estimated to have decreased by 67% in 2025 from those in 2024 to 7,000 kilograms owing to China's ban on germanium exports to the United States in 2024. Imports of germanium dioxide increased by 55% from those in 2024 to an estimated 17,000 kilograms, likely owing to increased purchasing before potential tariff changes on imported goods from Canada. In the past, China has been a major source of germanium metal to the United States, and Canada has been a major source of germanium dioxide.

In August, the U.S. Department of Energy announced several investment initiatives totaling $1 billion to advance the domestic supply chain of critical minerals and materials, including funding for the refining and alloying of select materials, including germanium, for semiconductors and funding for facilities to produce certain mineral byproducts, including germanium, from existing industrial processes.

Global germanium refinery production and recycling data were limited, and available estimates were difficult to verify. China continued to be the leading global producer and exporter of germanium metal in 2025. In August 2023, the Government of China implemented an export licensing program for germanium. In December 2024, China banned all exports of germanium to the United States. China's reported exports of germanium metal for the year through September 2025 decreased to 7,520 kilograms from 18,787 kilograms and 36,656 kilograms in the same periods in 2024 and 2023, respectively. In 2025, exports were mostly sent to Russia (28%), Belgium (26%), Germany (26%), and Japan (18%).

Germanium metal and germanium dioxide prices (Europe, minimum 99.999% purity) increased between January and October 2025, with the price for germanium metal increasing from $3,150 per kilogram to $5,380 per kilogram and the price for germanium dioxide increasing from $2,200 per kilogram to $2,850 per kilogram.

World Refinery Production and Reserves:[7] Germanium was known to have been processed or recycled commercially in only a few countries, including the United States, Belgium, Canada, China, Germany, and Russia, with China being the leading producer of germanium. Because most producers do not publicly report germanium production, global production data were limited. Substantial germanium-rich deposits, including tailings sites, that were in operation or in active development were in China, Congo (Kinshasa), Russia, and the United States. However, data were generally not available on the reserves of these deposits.

World Resources:[7] Germanium reserves data were not widely reported at a mine or country level and thus difficult to quantify. The available resources of germanium are associated with certain zinc and lead-zinc-copper sulfide ores and lignite coal deposits.

Substitutes: Silicon or gallium arsenide substitute for germanium in certain electronic applications. Some metallic compounds can be substituted in high-frequency electronics applications and in some light-emitting-diode applications. Chalcogenide glass has been used as a substitute for germanium metal in infrared applications. Antimony and titanium are substitutes for use as polymerization catalysts.

[e]Estimated. NA Not available. — Zero.
[1]Data have been adjusted to exclude low-value shipments. Germanium dioxide data were multiplied by 69% to calculate the germanium content.
[2]Defined as change in total inventory from prior yearend inventory. If negative, increase in inventory. Beginning in 2023, Government stock changes no longer available.
[3]Estimated consumption of germanium contained in metal and germanium dioxide.
[4]Average European price for minimum 99.999% purity. Source: Argus Media group, Argus Non-Ferrous Markets.
[5]Defined for 2021–22 as imports – exports ± adjustments for Government stock changes. Beginning in 2023, Government stock changes no longer included.
[6]See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.
[7]See Appendix C for resource and reserve definitions and information concerning data sources.

GOLD

(Data in metric tons,[1] gold content, unless otherwise specified)

Domestic Production and Use: In 2025, domestic gold mine production was estimated to be 160 tons; the value was estimated to be $17 billion, a 32% increase from the value in 2024. Gold was produced at more than 40 lode mines in 12 States, at several large placer mines in Alaska, and at numerous smaller placer mines (mostly in Alaska and in the Western States). Nevada was the leading gold-producing State, accounting for about 64% of total domestic production, followed by Alaska, which produced about 22% of domestic gold. About 7% of domestic gold was recovered as a byproduct of processing domestic base-metal ores, chiefly copper ores. The top 25 operations yielded about 94% of the mined gold produced in the United States. Commercial-grade gold was produced at approximately 16 refineries. A few dozen companies, out of several thousand companies and artisans, dominated the fabrication of gold into commercial products. U.S. jewelry manufacturing was heavily concentrated in the New York, NY, and Providence, RI, areas, with lesser concentrations in California, Florida, and Texas.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production:					
Mine	187	173	170	163	160
Refinery:					
Primary	181	181	177	180	170
Secondary (new and old scrap)	92	93	96	89	90
Imports for consumption[2]	192	138	215	190	320
Exports[2]	386	420	252	289	260
Consumption, reported[3]	265	252	253	210	150
Stocks, Treasury, yearend[4]	8,130	8,130	8,130	8,130	8,130
Price, dollars per troy ounce[5]	1,801	1,802	1,945	2,388	3,300
Employment, mine and mill, number[6]	11,700	11,500	12,200	13,200	13,000
Net import reliance[7] as a percentage of reported consumption	E	E	E	E	([8])

Recycling: In 2025, an estimated 90 tons of new and old scrap was recycled, equivalent to about 60% of reported consumption. The domestic supply of gold from recycling was slightly higher compared with that in 2024.

Import Sources (2021–24): Ores and concentrates: Canada, 99%; and other, 1%. Dore: Mexico, 37%; Colombia, 22%; Argentina, 14%; Nicaragua, 8%; and other, 19%. Bullion: Canada, 46%; Switzerland, 16%; South Africa,10%; Colombia, 7%; and other, 21%. Total: Canada, 27%; Mexico, 20%; Colombia, 14%; Switzerland, 9%; and other, 30%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Precious metal ore and concentrates:		
Gold content of silver ores	2616.10.0080	0.8 ¢/kg on lead content.
Gold content of other ores	2616.90.0040	1.7 ¢/kg on lead content.
Gold bullion	7108.12.1013	Free.
Gold dore	7108.12.1020	Free.
Gold scrap	7112.91.0100	Free.

Depletion Allowance: 15% (domestic), 14% (foreign).

Government Stockpile: The U.S. Department of the Treasury maintains stocks of gold (see salient statistics above) and the U.S. Department of War administers a Governmentwide secondary precious-metals recovery program.

Events, Trends, and Issues: The estimated gold price in 2025 increased by 38% and reached a new record-high annual price compared with the previous record-high annual price in 2024. The Engelhard daily price for gold in 2025 fluctuated, increasing in the first and second quarters, decreasing at the beginning of the third quarter, and increasing into the beginning of the fourth quarter.

In 2025, worldwide gold mine production was an estimated 3,300 tons compared with 3,280 tons in 2024. China, Russia, Australia, Canada, and the United States were the leading gold producers, in descending order of production, and together accounted for 41% of estimated global production in 2025.

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GOLD

Estimated global gold consumption, excluding exchange-traded funds and other similar investments, was in jewelry, 40%; physical bars, 24%; central banks and other institutions, 21%; official coins and medals and imitation coins, 7%; electrical and electronics, 7%; and other, 1%. In the first 9 months of 2025, global consumption of gold in physical bars increased by 18%, electronics were unchanged, other industrial applications decreased by 4%, dentistry decreased by 8%, coins and medals decreased by 11%, and jewelry decreased by 20% compared with those in the first 9 months of 2024. During the first 9 months of 2025, gold holdings in central banks decreased by 13%, and global investments in gold-based exchange-traded funds and similar investments were 619 tons in the first 9 months of 2025, an increase by more than 25 times compared with the first 9 months of 2024. Total global consumption in the first 9 months of 2025 increased by 10% compared with that in the first 9 months of 2024.[9]

World Mine Production and Reserves: Reserves for Australia, Brazil, China, Peru, and "Other countries" were revised based on company and Government reports.

	Mine production		Reserves[10]
	2024	2025[e]	
United States	163	160	3,000
Australia	284	280	[11]13,000
Brazil	[e]82	80	2,500
Canada	[e]200	200	3,200
China	377	380	3,200
Ghana	149	150	1,000
Indonesia	[e]94	90	3,600
Kazakhstan	[e]130	130	2,300
Mexico	140	140	1,400
Peru	108	110	2,200
Russia	[e]310	310	12,000
South Africa	90	90	5,000
Uzbekistan	129	130	2,200
Other countries	1,020	1,000	11,000
World total (rounded)	3,280	3,300	66,000

World Resources:[10] An assessment of U.S. gold resources indicated 33,000 tons of gold—15,000 tons in identified and 18,000 tons in undiscovered resources.[12] Nearly one-quarter of the gold in undiscovered resources was estimated to be contained in porphyry copper deposits. The gold resources in the United States, however, are only a small portion of global gold resources.

Substitutes: Base metals clad with gold alloys are widely used to economize on gold in electrical and electronic products and in jewelry; many of these products are continually redesigned to maintain high-utility standards with lower gold content. Generally, palladium, platinum, and silver may substitute for gold.

[e]Estimated. E Net exporter.
[1]One metric ton (1,000 kilograms) = 32,150.7 troy ounces.
[2]Includes refined bullion, dore, ores, concentrates, and precipitates. Excludes waste and scrap, official monetary gold, gold in fabricated items, gold in coins, and net bullion flow (in tons) to market from foreign stocks at the New York Federal Reserve Bank.
[3]Includes gold used in the production of consumer purchased bars, coins, and jewelry. Excludes gold as an investment (except consumer purchased bars and coins). Source: World Gold Council.
[4]Stocks were valued at the official price of $42.22 per troy ounce.
[5]Engelhard's average gold price quotation for the year. In 2025, the price was estimated by the U.S. Geological Survey based on data from January through November.
[6]Data from the Mine Safety and Health Administration.
[7]Defined as imports – exports.
[8]Large unreported investor stock purchases preclude calculation of a meaningful net import reliance.
[9]Source: World Gold Council.
[10]See Appendix C for resource and reserve definitions and information concerning data sources.
[11]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 4,500 tons.
[12]Source: U.S. Geological Survey National Mineral Resource Assessment Team, 2000, 1998 assessment of undiscovered deposits of gold, silver, copper, lead, and zinc in the United States: U.S. Geological Survey Circular 1178, 21 p.

GRAPHITE (NATURAL)

(Data in metric tons unless otherwise specified)

Domestic Production and Use: In 2025, no natural graphite was produced domestically in the United States. Domestic production of amorphous graphite was last recorded in Montana in 1989, and flake graphite was last produced in Texas in 1979. In 2025, U.S. companies consumed an estimated 71,000 tons of natural graphite valued at $128 million. Natural graphite was widely used in batteries, brake linings, lubricants, powdered metals, refractory applications, and steelmaking, and was also incorporated into some defense-related materials and components. During 2025, U.S. natural graphite imports were an estimated 79,000 tons, consisting of 73.4% flake and high-purity, 26.2% amorphous, and 0.4% lump and chip graphite.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025e**
Production, mine	—	—	—	—	—
Imports for consumption	53,000	89,200	73,500	73,900	79,000
Exports	8,660	9,500	7,780	8,740	8,400
Consumption, apparent[1]	44,300	79,700	65,700	65,200	71,000
Price, average unit value of imports, dollars per metric ton at foreign ports:					
Flake	1,330	1,200	1,080	1,050	1,000
Lump and chip (Sri Lanka)	2,010	2,590	2,380	2,810	2,600
Amorphous	629	563	607	535	470
Net import reliance[1] as a percentage of apparent consumption	100	100	100	100	100

Recycling: Refractory brick and linings, alumina-graphite refractories for continuous metal castings, magnesia-graphite refractory brick for basic oxygen and electric arc furnaces, and insulation brick was increasing, with material being recycled into products such as brake linings and thermal insulation. The abundance of graphite in the world market inhibits increased recycling efforts. Information on the quantity and value of recycled graphite was not available.

Import Sources (2021–24): China,[2] 46%; Canada, 13%; Mozambique, 13%; Mexico, 12%; and other, 16%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Crystalline flake (not including flake dust)	2504.10.1000	Free.
Powder	2504.10.5000	Free.
Other	2504.90.0000	Free.

Depletion Allowance: Lump and amorphous, 22% (domestic) and flake, 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: In 2022, U.S. apparent consumption of natural graphite reached its highest level since 1978 and remained elevated through 2025. Imports of graphite battery anode material, natural and synthetic, during the first 8 months of 2025 were 43,400 tons compared with 28,100 tons for the same period in 2024. The leading sources in 2025 were China (55%), Indonesia (31%), and the Republic of Korea (14%).

In December 2024, a group of graphite producers based in North America submitted a petition asking the U.S. Department of Commerce (DOC) and the U.S. International Trade Commission (ITC) to review China's trade practices involving graphite active anode material (AAM). The ITC determined that AAM from China was likely being sold at less than fair market value in the United States. In 2025, the DOC released its preliminary results, which set antidumping duties at 93.50% and countervailing duties ranging from 11.58% to 721.03% depending on the company.

In 2025, China was the world's leading natural graphite supplier, producing an estimated 82% of total world production. Most production of natural graphite in China was crystalline flake. During the first 9 months of the year, China exported 115,000 tons of natural graphite, 6% more than the 109,000 tons exported during the same period in 2024. During the first 9 months of 2025, China exported 37,400 tons of spherical purified graphite (SPG), 29% more than the 29,100 tons exported during the same period in 2024. The leading recipients of natural graphite from China in the first 9 months of 2025 were Japan (36%), Indonesia (22%), the Republic of Korea (10%), and Germany (8%). The leading recipients of SPG from China in the first 9 months of 2025 were the Republic of Korea (40%), Indonesia (33%), Japan (16%), and the United States (11%). The increase of exports to Indonesia were likely owing to a Chinese company's new SPG facility that began production in Central Java, Indonesia. Chinese companies were also developing or considering SPG facilities in Finland, Malaysia, Morocco, Oman, and Sweden.

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GRAPHITE (NATURAL)

Five companies were considering or developing graphite-mining projects in the United States: two in Alabama, one in Alaska, one in Montana, and one in New York. In Alaska, the company completed a feasibility study in 2025, which included plans to produce an average of 175,000 tons per year of graphite concentrate over 20 years. The project was also added to the Fixing America's Surface Transport Act dashboard, which seeks to decrease permitting timelines. In New York, a zinc producer continued development of the Kilbourne graphite deposit near its existing zinc mine. The company also began construction of a graphite demonstration plant to produce natural graphite concentrate for qualification purposes.

In 2025, Tanzania more than doubled graphite production to 75,000 tons. Commercial production began in 2017 with a Tanzanian company in Manyara, and in 2019 a Chinese company started production in Tanga. In 2024, Australian and Chinese companies commissioned graphite mines in Lindi and Manyara, respectively. In Mozambique, a Chinese company began production at a new graphite mine in Niassa and an Australian company restarted production at the Balama Mine in June after being suspended since late 2024. In Brazil, two companies continued to ramp up production at the Boa Sorte and Santa Cruz graphite mines, both of which began production in 2024. Additionally, a Russian company began graphite production at the Soyuznoye deposit in 2025.

SPG was produced in the United States by two companies in Illinois and Louisiana. In Alabama, a company commissioned an SPG qualification line at its plant in Kellyton. At least eight other companies were considering SPG plants in the United States. In Australia, a company commissioned an SPG demonstration plant in Queensland.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Austria, Brazil, Canada, India, the Republic of Korea, Mexico, Mozambique, Norway, Tanzania, Ukraine, and Vietnam based on company and Government reports. Reserves for China were revised based on Government reports.

	Mine production		Reserves[3]
	2024	2025[e]	
United States	—	—	([4])
Austria	100	200	([4])
Brazil	58,000	65,000	74,000,000
Canada	11,700	8,000	5,900,000
China	1,270,000	1,400,000	100,000,000
Germany	140	140	([4])
India	17,600	17,000	8,600,000
Korea, North	[e]8,100	8,000	2,000,000
Korea, Republic of	1,000	500	1,800,000
Madagascar	85,000	80,000	27,000,000
Mexico	706	740	3,100,000
Mozambique	39,000	60,000	25,000,000
Norway	5,340	6,600	600,000
Russia	[e]20,000	25,000	14,000,000
Sri Lanka	3,000	3,200	1,500,000
Tanzania	[e]27,000	75,000	18,000,000
Turkey	2,600	2,200	6,900,000
Ukraine	900	800	([4])
Vietnam	500	500	9,700,000
World total (rounded)	1,550,000	1,800,000	310,000,000

World Resources:[3] Domestic resources of graphite are relatively small, but the rest of the world's resources exceed 800 million tons of recoverable graphite.

Substitutes: Synthetic graphite powder, scrap from discarded machined shapes, and calcined petroleum coke compete for use in iron and steel production. Synthetic graphite powder and secondary synthetic graphite from machining graphite shapes compete for use in battery applications. Finely ground coke with olivine is a potential competitor in foundry-facing applications. Molybdenum disulfide competes as a dry lubricant but is more sensitive to oxidizing conditions.

[e]Estimated. — Zero.
[1]Defined as imports – exports.
[2]Includes Hong Kong.
[3]See Appendix C for resource and reserve definitions and information concerning data sources.
[4]Included in "World total."

GYPSUM

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: In 2025, domestic production of crude gypsum was estimated to be 20 million tons with a value of about $260 million. The leading crude gypsum-producing States were estimated to be Iowa, Kansas, Michigan, Nevada, Oklahoma, and Texas. Overall, 47 companies produced or processed gypsum in the United States at 45 mines in 15 States. The majority of domestic consumption, which totaled approximately 44 million tons, was used by agriculture, cement production, and manufacturers of wallboard and plaster products. Small quantities of high-purity gypsum, used in a wide range of industrial processes, accounted for the remaining tonnage. At the beginning of 2025, the production capacity of gypsum panel manufacturing in the United States was about 34 billion square feet[1] per year. Total wallboard sales in 2025 were estimated to be 26 billion square feet.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production:					
Crude	20,800	22,300	21,500	20,800	20,000
Synthetic[2]	15,900	15,400	[e]17,000	[e]17,000	17,000
Calcined[3]	18,600	18,700	18,300	18,700	18,000
Wallboard products sold, million square feet[1]	27,300	28,200	27,000	27,200	26,000
Imports, crude, including anhydrite	6,520	6,870	7,770	7,160	6,800
Exports, crude, not ground or calcined	42	40	46	51	38
Consumption, apparent[4]	43,200	44,600	45,800	44,900	44,000
Price, annual average, dollars per metric ton:					
Crude, free on board (f.o.b.) mine	10	11	12	12	13
Calcined, f.o.b. plant	42	50	60	60	62
Employment, mine and calcining plant, number[e]	4,500	4,500	4,500	4,500	4,500
Net import reliance[5] as a percentage of apparent consumption	15	15	17	16	15

Recycling: Approximately 700,000 tons per year of gypsum scrap that was generated by wallboard manufacturing was recycled onsite. The recycling of wallboard from new construction and demolition sources also took place, although those amounts are unknown. Recycled gypsum was used primarily for agricultural purposes and feedstock for the manufacture of new wallboard. Other potential markets for recycled gypsum include athletic-field marking, cement production (as a stucco additive), grease absorption, sludge drying, and water treatment.

Import Sources (2021–24): Spain, 38%; Mexico, 30%; Canada, 28%; Turkey, 3%; and other, 1%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Gypsum, anhydrite	2520.10.0000	Free.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: U.S. crude gypsum production was estimated to have decreased by 4% to 20 million tons compared with 20.8 million tons in 2024, and apparent consumption was an estimated 44 million tons in 2025 compared with 44.9 million tons in 2024. Gypsum imports for consumption decreased by an estimated 5% compared with those in 2024. Exports, although very low compared with imports, decreased by an estimated 25%.

Demand for gypsum depends principally on construction industry activity, particularly in the United States, where most gypsum consumed is used for building plasters, the manufacture of portland cement, and wallboard products. According to the U.S. Census Bureau, housing starts through August 2025 were at a seasonally adjusted annual rate of 1,307,000, 6% less than the August 2024 rate of 1,391,000 starts.

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GYPSUM

Synthetic gypsum consumption, after more than 20 years of large annual growth rates, has remained somewhat static in recent years. This is largely a result of an increase in natural gas electrical generation and a decrease in coal-fired electrical generation. Increased use of wallboard in Asia, coupled with new gypsum product plants, spurred increased production in the region. As wallboard becomes more widely used, worldwide gypsum production is expected to increase.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Brazil, Canada, and Uzbekistan based on company and Government reports.

	Mine production[e]		Reserves[6]
	2024	2025	
United States	[7]20,800	20,000	700,000
Algeria	2,500	2,500	NA
Australia	4,200	4,200	NA
Brazil	5,800	5,800	450,000
Canada	3,600	3,600	450,000
China	12,000	12,000	1,800,000
France	2,400	2,400	300,000
Germany	4,700	4,700	NA
India	4,300	4,300	37,000
Iran	16,000	16,000	750,000
Japan	4,300	4,300	NA
Mexico	5,400	5,400	NA
Oman	14,000	14,000	NA
Russia	4,300	4,300	NA
Saudi Arabia	3,800	3,800	NA
Spain	11,000	11,000	NA
Thailand	8,700	8,700	910,000
Turkey	10,000	10,000	200,000
Uzbekistan	2,500	2,500	NA
Other countries	22,000	20,000	NA
World total (rounded)	162,000	160,000	Large

World Resources:[6] Reserves are large in major producing countries, but data for most were not available. Domestic gypsum resources are adequate but unevenly distributed. Large imports from Canada augment domestic supplies for wallboard manufacturing in the United States, particularly in the eastern and southern coastal regions. Imports from Mexico supplement domestic supplies for wallboard manufacturing along portions of the United States west coast. Large gypsum deposits occur in the Great Lakes region, the midcontinent region, and several Western States. Foreign resources are large and widely distributed; gypsum production was estimated for 78 countries in 2025.

Substitutes: In such applications as stucco and plaster, cement and lime may be substituted for gypsum; brick, glass, metallic or plastic panels, and wood may be substituted for wallboard. Gypsum has no practical substitute in the manufacturing of portland cement. Synthetic gypsum generated by various industrial processes, including flue gas desulfurization of smokestack emissions, is very important as a substitute for mined gypsum in wallboard manufacturing, cement production, and agricultural applications (in descending order by tonnage). In 2025, synthetic gypsum was estimated to account for about 39% of the total domestic gypsum supply.

[e]Estimated. NA Not available.
[1]The standard unit used in the U.S. wallboard industry is square feet; multiply square feet by 0.0929 to convert to square meters. Source: The Gypsum Association.
[2]Synthetic gypsum used; the majority of these data were obtained from the American Coal Ash Association.
[3]From domestic crude and synthetic gypsum.
[4]Defined as crude production + synthetic used + imports – exports.
[5]Defined as imports – exports.
[6]See Appendix C for resource and reserve definitions and information concerning data sources.
[7]Reported.

HELIUM AND RARE GASES

(Helium, neon, argon, krypton, and xenon)
(Data in million cubic meters unless otherwise specified)

Domestic Production and Use: In 2025, sales of Grade-A helium[1] (99.997% helium or greater) and gaseous helium (greater than 98% helium) were an estimated 81 million cubic meters (2.9 billion cubic feet) valued at an estimated $970 million. Nine plants produced crude helium (60% to 80% helium), 11 plants produced gaseous helium, 5 plants produced Grade-A helium, and 4 plants purified helium to Grade-A helium from other crude helium sources. Three locations in Texas stored helium in underground caverns. Helium was used for, in decreasing quantity of use, analytical, engineering, lab, science, and specialty gases (22%); controlled atmospheres, fiber optics, and semiconductors (17%); lifting gas (17%); magnetic resonance imaging (15%); aerospace (9%); welding (8%); diving (5%); leak detection (5%); and other applications (2%). Helium-3, which is a rare isotope of helium, was produced at one location in South Carolina via tritium decay. Production data were withheld to avoid disclosing proprietary data. Helium-3 was mainly used for neutron detectors, research, and quantum computing.

Rare gases are produced through fractional distillation in air separation units. In 2025, argon was produced from 274 operations in many States. Other rare gases were produced from a small number of operations in seven States. In 2025, estimated sales were 110 million liters for neon, 1.1 billion cubic meters for argon,[2] 1.5 million liters for krypton, and 100,000 liters for xenon. Neon was used for, in decreasing quantity of use, lamps (53%), semiconductors (32%), plasma displays (12%), and other (3%). Argon was used for welding (66%), steelmaking (20%), electronics (10%), and other (4%). Krypton was used for semiconductors (67%), lamps (20%), insulated glass (10%), and other (3%). Xenon was used for lamps (37%), semiconductors (36%), lasers (13%), medical (6%), and other (8%).

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Sold or Used:					
Grade-A and gaseous helium[3]	76	77	81	80	81
Neon, million liters	[e]120	[e]120	[e]120	[4]112	110
Argon	[e]1,000	[e]1,000	[e]1,000	[4]1,040	1,100
Krypton, million liters	[e]1.6	[e]1.5	[e]1.5	[4]1.5	1.5
Xenon, million liters	[e]0.1	[e]0.1	[e]0.1	[4]0.1	0.1
Imports for consumption:					
Helium	8	6	8	12	8
Neon, million liters[e]	60	75	95	[4]113	120
Argon	32	29	36	40	35
Krypton, million liters[e]	17	18	19	[4]19	19
Xenon, million liters[e]	3.8	3.8	3.9	[4]4	4
Exports:					
Helium	33	34	34	41	38
Neon, krypton, and xenon, million liters[e]	—	—	—	—	—
Argon	23	22	38	41	60
Consumption, apparent:[5]					
Grade-A and gaseous helium	51	50	56	51	51
Neon, million liters	180	190	210	[4]225	230
Argon	1,000	1,000	1,000	[4]1,040	1,100
Krypton, million liters	19	20	21	[4]21	21
Xenon, million liters	3.9	3.9	4.0	[4]4.1	4.1
Net import reliance[6] as a percentage of apparent consumption:					
Helium	E	E	E	E	E
Neon	33	39	45	50	52
Argon	1	1	E	E	E
Krypton	91	92	93	93	93
Xenon	97	97	98	98	98

The estimated base price[7] for Grade-A helium was about $12 per cubic meter ($330 per thousand cubic feet) in 2025, with producers posting surcharges to this price. Price data for rare gases were unavailable.

Recycling: In the United States, helium and rare gases used in large-volume applications were seldom recycled. Some low-volume or liquid boil-off recovery systems were used. Closed-loop recycling systems were becoming more common. Some air separation units processed industrial gas streams to increase rare gas recovery.

Import Sources (2021–24): Helium: Canada, 47%; Qatar, 28%; Algeria, 10%; China, 5%; and other, 10%. Argon: Canada, 90%; Hungary, 6%; Austria, 3%; and other, 1%. Import sources data for other rare gases were not available.

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HELIUM AND RARE GASES

Tariff: Item	Number	Normal Trade Relations 12–31–25
Argon	2804.21.0000	3.7% ad valorem.
Rare gases, other than argon (including helium)	2804.29.0000	3.7% ad valorem.

Depletion Allowance: Allowances are applicable to natural gas from which helium is extracted, but no allowance is granted directly to helium. No depletion allowances for rare gases as they are extracted from the air.

Government Stockpile: None.

Events, Trends, and Issues: In 2025, six new helium operations (three in New Mexico and one each in Colorado, Kansas, and Montana) began producing helium in the United States. A helium storage cavern was brought online in Beaumont, TX, which was able to store excess helium production. A new helium facility began operations in Canada, and another began operations in South Africa. Multiple companies explored for and developed helium deposits throughout the world. Some of these helium deposits are nonhydrocarbon sourced. The European Union and the United States sanctions that imposed an import ban on helium from Russia continued into 2025.

In 2025, four air separation units (one each in Louisiana, Ohio, Tennessee, and Texas) capable of producing argon began operations. Several new air separation units capable of producing rare gases began operations or entered development globally, with most of these projects concentrated in Asia. Rare gas supply from Russia and Ukraine continued to be limited owing to the conflict between Russia and Ukraine.

World Production and Reserves: Helium reserves for South Africa were revised based on company reports. World production of helium-3 was estimated to be 40,000 liters in 2024 and 2025 with most of the production coming from Canada, Russia, and the United States. World production of argon was large.

	Helium		
	Production 2024	Production 2025[e]	Reserves[8]
United States	[3]80	[3]81	8,500
Algeria	[e]11	11	[e]1,800
Canada	6	6	NA
China	3	3	NA
Poland	3	3	24
Qatar	[e]64	63	[e]Large
Russia	[e]17	18	[e]1,700
South Africa	—	([9])	400
World total (rounded)	[e]183	190	NA

	Rare gases production[e, 4] (million liters)					
	Neon 2024	Neon 2025	Krypton 2024	Krypton 2025	Xenon 2024	Xenon 2025
United States	112	110	1.5	1.5	0.1	0.1
Other countries	688	700	110	110	12	12
World total (rounded)	800	800	112	110	12	12

World Resources:[8] The mean volume of recoverable helium within the identified geologic natural gas reservoirs in the United States was estimated to be 8.49 billion cubic meters (306 billion cubic feet) not including helium in storage facilities. Identified helium resources of the world, exclusive of the United States, were estimated to be 31.3 billion cubic meters (1.13 trillion cubic feet). The locations and volumes of major deposits, in billion cubic meters, are Qatar, 10.1; Algeria, 8.2; Russia, 6.8; Canada, 2.0; and China, 1.1. Rare gases are extracted from the atmospheric air.

Substitutes: Nothing substitutes for helium in cryogenic applications if temperatures below −429 degrees Fahrenheit are required. Superconductors, including those in magnetic resonance imaging, are being developed to operate at higher temperatures using nitrogen instead of helium as a coolant. Hydrogen can be substituted for helium in some lighter-than-air applications. Argon and hydrogen can be used as a substitute for helium in diving applications. Argon, helium, and nitrogen can be substituted for each other in welding applications. Helium and rare gases can be substituted for each other in inert-atmosphere uses. Rare gases can be substituted for each other in lighting uses.

[e]Estimated. E Net exporter. NA Not available. — Zero.
[1]Measured at 101.325 kilopascals, 27.737 cubic meters of helium at 15 degrees Celsius (°C) = 1,000 cubic feet at 21.1 °C = 0.0047 metric tons.
[2]Measured at 101.325 kilopascals, 1 cubic meter of argon at 0 °C = 38.04 cubic feet at 21.1 °C = 0.0018 metric tons.
[3]Includes helium extracted from Canada and purified to Grade-A helium in the United States.
[4]Source: Intelligas Consulting LLC and TECHCET CA LLC.
[5]Defined as sales + imports – exports.
[6]Defined as imports – exports.
[7]Not including free on board (f.o.b.) or other costs associated with transporting helium from the producer to the buyer.
[8]See Appendix C for resource and reserve definitions and information concerning data sources.
[9]Less than ½ unit.

INDIUM

(Data in metric tons unless otherwise specified)

Domestic Production and Use: Indium was not recovered from ores in the United States in 2025. Several companies produced indium products—including alloys, compounds, high-purity metal, and solders—from imported indium metal. Production of indium tin oxide (ITO) continued to account for most global indium consumption. ITO thin-film coatings were primarily used for electrically conductive purposes in a variety of flat-panel displays—most commonly liquid crystal displays (LCDs). Other indium end uses included alloys and solders, compounds, electrical components and semiconductors, and research. Estimated domestic consumption of refined indium was 220 tons in 2025 and was based on the annual estimated import quantity. There were no readily available recycling or end-use data available for indium. The estimated price for refined indium in 2025 was about $350,000 per ton.[1]

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production, refinery	—	—	—	—	—
Imports for consumption	158	202	219	220	220
Exports	NA	NA	NA	NA	NA
Consumption, estimated[2]	158	202	219	220	220
Price, annual average, dollars per kilogram:					
U.S. warehouse, free on board[3]	223	250	244	351	370
Rotterdam, duties unpaid[4]	217	252	249	311	380
Net import reliance[5] as a percentage of estimated consumption	100	100	100	100	100

Recycling: Indium is most commonly recovered from ITO scrap in Japan and the Republic of Korea. Indium-containing scrap was recycled domestically; however, data on the quantity of indium recovered from scrap were not available.

Import Sources (2021–24): Republic of Korea, 25%; Japan 22%; China,[6] 12%; Canada, 11%; and other, 30%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Unwrought indium, including powders	8112.92.3000	Free.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: In 2025, the estimated annual average U.S. warehouse price (free on board) was $390 per kilogram, 11% more than the reported average price in 2024. The U.S. price, as reported by Argus Media group, Argus Non-Ferrous Markets, began the year at $383 per kilogram. In June, the price peaked at $408 per kilogram.

China is the leading global producer of indium, accounting for 70% of the world total. In February 2025, China's Ministry of Commerce subjected several critical minerals, including indium, to new export restrictions. Asian Metal reported that exports of unwrought indium declined by 72%, year over year, from September 2024 to September 2025.

Fifth-generation (5G) technologies continued to increase demand for indium. Indium phosphide (InP)-based substrates are used in 5G fiber-optic telecommunications networks where InP lasers and receivers send data through fiber-optic lines, which allow for lower latency, reduced signal loss, and faster speeds.

Artificial intelligence was expected to increase demand for specialized chip materials, including those made of InP, that allow for more advanced computation. Indium, as ITO, is used as a coating on data-center fibers and cables to increase signal transmission and reduce loss. InP is also used in high-speed photodetectors and laser diodes for optical communications. Additionally, some electrical components in data centers use indium-based solder alloys.

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INDIUM

World Refinery Production and Capacity:

	Refinery production		Refinery capacity
	2024	2025[e]	2025[e]
United States	—	—	—
Belgium	19	19	50
Canada	40	40	70
China	760	760	1,100
France	21	21	70
Japan	65	65	70
Korea, Republic of	180	180	310
Russia	5	5	15
Uzbekistan	1	1	NA
World total (rounded)	1,090	1,100	1,700

World Resources:[7] Indium is most commonly recovered from the zinc-sulfide ore mineral sphalerite. The indium content of zinc deposits from which it is recovered ranges from less than 1 part per million to 100 parts per million. Although the geochemical properties of indium are such that it occurs in trace amounts in other base-metal sulfides—particularly chalcopyrite and stannite—indium recovery from most deposits of these minerals was not economic.

Substitutes: Antimony tin oxide coatings have been developed as an alternative to ITO coatings in LCDs and have been successfully annealed to LCD glass; carbon nanotube coatings have been developed as an alternative to ITO coatings in flexible displays, solar cells, and touch screens; poly (3,4-ethylene dioxythiophene) (PEDOT) has also been developed as a substitute for ITO in flexible displays and organic light-emitting diodes; and copper or silver nanowires have been explored as a substitute for ITO in touch screens. Graphene has been developed to replace ITO electrodes in solar cells and also has been explored as a replacement for ITO in flexible touch screens. Researchers have developed a more adhesive zinc oxide nanopowder to potentially replace ITO in LCDs. Hafnium can replace indium in nuclear reactor control rod alloys.

[e]Estimated. NA Not available. — Zero.

[1]Source: Daily Metal Prices, 2025, Daily metal spot prices—Indium prices for the last day: Daily Metal Prices. (Accessed September 30, 2025, at https://www.dailymetalprice.com/metalprices.php.)

[2]Estimated to equal imports.

[3]Price is based on 99.99%-minimum-purity, free on board U.S. warehouse. Source: Argus Media group, Argus Non-Ferrous Markets.

[4]Price is based on 99.99%-minimum-purity, duties unpaid (Rotterdam). Source: Argus Media group, Argus Non-Ferrous Markets.

[5]Defined as imports – exports.

[6]Includes Hong Kong.

[7]Refinery production data for indium were limited or unavailable for most countries. Estimates were derived from trade data, production capacity, and (or) changes in related lead and zinc smelter production.

IODINE

(Data in metric tons, elemental iodine, unless otherwise specified)

Domestic Production and Use: Iodine was produced from brines in 2025 by three companies operating in Oklahoma. U.S. iodine production in 2025 was withheld to avoid disclosing company proprietary data but was estimated to have decreased from that in 2024. The annual average cost, insurance, and freight unit value of iodine imports in 2025 was estimated to be $68 per kilogram, about 10% more than that in 2024.

Because domestic and imported iodine was used by downstream manufacturers to produce many intermediate iodine compounds, it was difficult to establish an accurate end-use pattern. Crude iodine and inorganic iodine compounds were estimated to account for about 75% of domestic iodine consumption in 2025, and organic iodine compounds were estimated to account for about 25%. Worldwide, the leading uses of iodine and its compounds were, in descending order of quantity consumed, X-ray contrast media (XRCM), liquid crystal displays (LCDs), pharmaceuticals, iodophors, animal feed, and fluorochemicals. Other applications of iodine included biocides, food supplements, and nylon.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production	W	W	W	W	W
Imports for consumption	4,120	4,270	2,860	3,490	3,000
Exports	1,280	1,140	1,410	1,340	1,300
Consumption:					
Apparent[1]	W	W	W	W	W
Reported	3,720	3,330	2,580	3,080	3,000
Price, crude iodine, average unit value of imports (cost, insurance, and freight), dollars per kilogram	32.72	45.81	61.55	61.84	68
Employment, number[e]	60	60	60	60	60
Net import reliance[2] as a percentage of apparent consumption	>50	>50	<50	>50	<50

Recycling: Small amounts of iodine were recycled.

Import Sources (2021–24): Chile, 88%; Japan, 11%; and other, 1%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Iodine, crude	2801.20.0000	Free.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

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IODINE

Events, Trends, and Issues: According to industry publications, spot prices for iodine crystal averaged about $73 per kilogram during the first 10 months of 2025. This was about 4% more than the 2024 annual average of $70.24 per kilogram.

One U.S. producer opened an eighth iodine production plant and increased its iodine production by almost 11% during the first 6 months of 2025 compared with that in the same period in 2024. Additionally, a leading producer in Chile planned to increase its production capacity by 4,000 tons per year.

As in recent years, Chile was the world's leading producer of iodine, followed by Japan and the United States. Excluding production in the United States, Chile accounted for about two-thirds of world production in 2025. Most of the world's iodine supply comes from three areas: the Chilean desert nitrate mines, the gasfields and oilfields in Japan, and the iodine-rich brine wells in northwestern Oklahoma.

World Mine Production and Reserves: Reserves data for Chile were revised based on Government reports. China and Uzbekistan also produce crude iodine, but output is not officially reported, and available information was inadequate to make reliable estimates of output.

	Mine production[e]		Reserves[3]
	2024	2025	
United States	W	W	250,000
Azerbaijan	210	210	170,000
Chile	22,000	23,000	750,000
Indonesia	30	50	NA
Iran	700	700	40,000
Japan	9,300	9,000	4,900,000
Russia	5	8	120,000
Turkmenistan	800	800	70,000
World total (rounded)	[4]33,000	[4]34,000	>6,300,000

World Resources:[3] Seawater contains 0.06 part per million iodine, and the oceans are estimated to contain approximately 90 billion tons of iodine. Seaweeds of the Laminaria family are able to extract and accumulate up to 0.45% iodine on a dry basis. Although not as economical as the production of iodine as a byproduct of gas, nitrates, and oil, the seaweed industry represented a major source of iodine prior to 1959 and remains a large resource.

Substitutes: No comparable substitutes exist for iodine in many of its principal applications, such as in animal feed, catalytic, nutritional, pharmaceutical, and photographic uses. Bromine and chlorine could be substituted for iodine in biocide, colorant, and ink, although they are usually considered less desirable than iodine. Antibiotics can be used as a substitute for iodine biocides.

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data.

[1]Defined as production + imports – exports.

[2]Defined as imports – exports.

[3]See Appendix C for resource and reserve definitions and information concerning data sources.

[4]Excludes U.S. production.

IRON AND STEEL[1]

(Data in million metric tons, metal, unless otherwise specified)

Domestic Production and Use: The U.S. iron and steel industry produced 82 million tons of raw steel in 2025 with an estimated sales value of about $149 billion, a slight decrease from $150 billion in 2024. At the beginning of 2025, pig iron and raw steel were produced by two companies operating integrated steel mills in eight active locations. Multiple integrated steel mills were fully or partially idled over the last 3 years, and prior reporting of locations previously differentiated multiple facilities at the same location. Raw steel from electric arc furnaces was produced by 47 companies at 102 minimills. Combined raw steel production capacity was about 105 million tons per year, a slight decrease from 107 million tons in 2024. Indiana accounted for an estimated 19% of total raw steel production, followed by Ohio, 8%; Texas, 5%; and Pennsylvania, 4%; no other individual State accounted for more than 4% of total domestic raw steel production. Construction accounted for an estimated 31% of net shipments by market classification, followed by steel service centers and distributors, 26%; automotive, 15%; and steel for converting and processing, 11%; all other applications accounted for 17% of net shipments.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Pig iron production	22.2	20.0	22.5	20.6	21
Raw steel production	85.8	80.5	81.4	79.5	82
Continuously cast steel, percent	99.8	99.7	99.7	99.7	99.7
Shipments, steel mill products	85.9	81.2	81.0	78.7	82
Imports, steel mill products:					
Finished	20.6	22.9	19.7	20.4	19
Semifinished	7.9	5.1	5.9	5.8	5
Total	28.5	28.0	25.6	26.2	24
Exports, steel mill products:					
Finished	7.4	7.5	7.9	7.9	6
Semifinished	0.1	0.1	0.3	0.1	0.1
Total	7.5	7.6	8.2	8.0	7
Stocks, service centers, yearend[2]	7.0	6.7	6.5	6.5	6.7
Consumption, apparent (steel mill products)[3]	100	96.2	92.4	91.1	95
Producer price index, steel mill products (1982=100)[4]	351	382	320	291	290
Employment, average, number:					
Iron and steel mills[4]	78,300	80,800	84,000	84,900	86,000
Steel product manufacturing[4]	52,700	55,400	58,500	59,600	61,000
Net import reliance[5] as a percentage of apparent consumption	14	16	12	14	13

Recycling: See the Iron and Steel Scrap and the Iron and Steel Slag chapters.

Import Sources (2021–24): Canada, 23%; Mexico, 15%; Brazil, 13%; Republic of Korea, 9%; and other, 40%.

Tariff: **Item**	**Number**	**Normal Trade Relations 12–31–25**
Carbon steel:		
Semifinished	7207.00.0000	Free.
Flat, hot-rolled	7208.00.0000	Free.
Flat, cold-rolled	7209.00.0000	Free.
Galvanized	7210.00.0000	Free.
Bars and rods, hot-rolled	7213.00.0000	Free.
Structural shapes	7216.00.0000	Free.
Stainless steel:		
Semifinished	7218.00.0000	Free.
Flat-rolled sheets	7219.00.0000	Free.
Bars and rods	7222.00.0000	Free.

Depletion Allowance: Not applicable.

Government Stockpile:[6]

	FY 2025		**FY 2026**	
Material	**Potential acquisitions**	**Potential disposals**	**Potential acquisitions**	**Potential disposals**
Grain-oriented electrical steel	3,200	—	NA	NA
Tire cord steel[7]	2,370	—	NA	NA

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IRON AND STEEL

Events, Trends, and Issues: Under section 232 of the Trade Expansion Act, tariffs increased to a rate of 25% for all countries in March 2025, removing prior exceptions granted since the tariffs were implemented in 2018. In June, tariffs on steel products imported to the United States were increased to 50% for all countries. Various extensions, exclusions, and reciprocal clauses were introduced throughout 2025. In November, Proclamation 10993 granted a 2-year regulatory relief period from Clean Air Act standards set in 2024 affecting coke oven facilities, which manufacture metallurgical coke used in the production of steel in integrated steel mills that account for approximately 28% of domestic steel production.

In March, one company began construction on a new minimill in southern California with a production capacity of 450,000 tons per year of rebar steel. In June, a domestic steel manufacturer completed a deal to be acquired by a Japan-based steel company. The deal was approved by the U.S. Government with stipulations and was expected to generate $11 billion in domestic steelmaking investments through 2028. In September, that company also halted production at one mill in Illinois with a production capacity of 2.7 million tons per year of raw steel but was expected to keep the mill in an operational state with the possibility of resuming production. Citing strategic capacity adjustments to account for product-specific market conditions, another company indefinitely idled multiple facilities, including an Illinois basic oxygen furnace and mill with a production capacity of 700,000 tons per year of hot-rolled coil products; a Michigan basic oxygen furnace and continuous casting facilities with a production capacity of 1.99 million tons per year of pig iron and 2.40 million tons per year of carbon slabs, advanced high-strength steels, and other products; and a Pennsylvania minimill with a production capacity of 300,000 tons per year of rail and other products. That company also restarted a blast furnace in Ohio with a production capacity of 1.37 million tons per year of pig iron.

The World Steel Association[7] estimated global finished steel demand to remain unchanged in 2025 owing to declining steel demand in China offset by growth in developing economies including Egypt, India, Saudi Arabia, and Vietnam. Globally, the manufacturing sector was expected to be affected by affordability pressures on consumers and elevated production costs. Countries with economies reliant on the export of steel-intensive goods were negatively affected by trade tensions.

World Production:

	Pig iron		Raw steel	
	2024	2025[e]	2024	2025[e]
United States	20.6	21	79.5	82
Brazil	27	28	34	35
China	852	830	1,010	980
Germany	24	25	37	38
India	90	98	150	160
Iran	4	4	31	32
Japan	61	59	84	81
Korea, Republic of	44	41	64	60
Russia	51	47	71	65
Turkey	10	10	37	37
Vietnam	14	14	22	23
Other countries	78	93	269	280
World total (rounded)	1,280	1,300	1,880	1,900

World Resources: Not applicable. See the Iron Ore chapter for steelmaking raw-material resources.

Substitutes: Iron is the least expensive and most widely used metal. In most applications, iron and steel compete either with less expensive nonmetallic materials or with more expensive materials that have a performance advantage. Iron and steel compete with lighter materials, such as aluminum and plastics in the automotive industry; aluminum, concrete, and wood in construction; and aluminum, glass, paper, and plastics in containers.

[e]Estimated. NA Not available. — Zero.

[1]U.S. production and shipments data source is the American Iron and Steel Institute; see also the Iron and Steel Scrap and the Iron Ore chapters.

[2]Steel mill products. Source: Metals Service Center Institute, September 2025.

[3]Defined as steel mill product shipments + imports of finished steel mill products – exports of steel mill products ± adjustments for stock changes.

[4]Source: U.S. Department of Labor, Bureau of Labor Statistics, North American Industry Classification System Code 331100 and 332100.

[5]Defined as imports of finished steel mill products – total exports ± adjustments for industry stock changes.

[6]See Appendix B for definitions. Reported in metric tons. For fiscal year 2026, the Annual Materials Plan was not released.

[7]Source: World Steel Association, 2025, worldsteel Short Range Outlook October 2025: Brussels, Belgium, World Steel Association press release, October 13, 3 p. (Accessed November 18, 2025, at https://worldsteel.org/media/press-releases/2025/worldsteel-short-range-outlook-october-2025/.)

IRON AND STEEL SCRAP[1]

(Data in million metric tons, metal, unless otherwise specified)

Domestic Production and Use: In 2025, the total value of domestic purchases of iron and steel scrap (home scrap and net receipts of ferrous scrap by all domestic consumers from brokers, dealers, and other outside sources) was an estimated $19.7 billion, a 4% decrease compared with $20.4 billion in 2024. Manufacturers of pig iron, raw steel, and steel castings accounted for almost all scrap consumption by the domestic steel industry, using scrap together with pig iron and direct-reduced iron to produce steel products for various consumer industries. The ferrous castings industry consumed most of the remaining scrap to produce cast iron and steel products. Relatively small quantities of steel scrap were used for producing ferroalloys, for the precipitation of copper, and by the chemical industry; these uses collectively totaled less than 1 million tons.

U.S. apparent consumption of iron and steel scrap was an estimated 57 million tons in 2025 compared with 55 million tons in 2024. In 2025, estimated raw steel production, the leading use for iron and steel scrap, was 82 million tons compared with 79.5 million tons in 2024, and net shipments of steel mill products in 2025 were an estimated 82 million tons, compared with 78.7 million tons in 2024.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production:					
Home scrap	6.6	7.3	7.1	7.7	7.0
Net receipts	65	62	59	57	58
Imports for consumption	5.3	4.7	5.1	4.8	5.0
Exports	18	18	16	15	13
Consumption:					
Reported	59	56	55	55	57
Apparent[2]	58	57	55	55	57
Price, average, delivered, No. 1 heavy melting composite price, dollars per metric ton[3]	417.66	381.72	333.28	314.85	319
Stocks, consumer, yearend	4.4	3.9	4.2	4.0	3.9
Employment, foundries, number[4]	101,000	105,000	107,000	106,000	107,000
Net import reliance[5] as a percentage of reported consumption	E	E	E	E	E

Recycling: Recycled iron and steel scrap is a vital raw material for the production of new steel and cast-iron products. The steel and foundry industries in the United States have been structured to recycle scrap and, as a result, are highly dependent upon scrap. Recycling 1 ton of steel conserves 1.1 tons of iron ore, 0.6 ton of coking coal, and 0.05 ton of limestone. Recycling scrap also conserves energy because the remelting of scrap requires much less energy than the production of iron or steel products from iron ore.

Overall, the scrap recycling rate in the United States has averaged between 80% and 90% during the past decade, with automobiles making up the primary source of old steel scrap. Recycling of automobiles is nearly 100% each year, with rates fluctuating slightly owing to the rate of new vehicle production and general economic trends. More than 13 million tons per year of steel was recycled from automobiles, the equivalent of approximately 17 million cars, from more than 280 car shredders in North America. The recycling of steel from automobiles is estimated to save the equivalent energy necessary to power 18 million homes every year.

Recycling rates, which fluctuate annually, were estimated to be 97% for structural steel from construction, 78% for appliances, 74% for all construction end uses, 62% for steel containers, and 46% for miscellaneous end uses. For the latest year available, 2023, the five leading processors of steel scrap accounted for 26 million tons processed among 354 facilities. The recycling rates for appliance, can, and construction steel are expected to increase in the United States and at an even greater rate in emerging industrial countries. Public interest in recycling continues, and recycling has continued to be more profitable and convenient as environmental regulations for primary production increase.

In 2025, the primary source of recycled scrap was net receipts, accounting for 89% of recycled scrap, which included new scrap generated from manufacturing plants and old scrap sourced from outside sources, post-consumer recycling operations, and steel generated by other owned company plants. The remaining 11% was sourced from home scrap, including recirculated steel scrap generated by current operations and obsolete scrap generated onsite.

Import Sources (2021–24): Canada, 71%; Mexico, 15%; Netherlands, 4%; Sweden, 3%; and other, 7%.

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IRON AND STEEL SCRAP

Tariff: Item	Number	Normal Trade Relations 12–31–25
Ferrous waste and scrap:		
Cast iron	7204.10.0000	Free.
Stainless steel	7204.21.0000	Free.
Other alloy steel	7204.29.0000	Free.
Tinned iron or steel	7204.30.0000	Free.
No. 1 bundles	7204.41.0020	Free.
No. 2 bundles	7204.41.0040	Free.
Borings, shovelings, and turnings	7204.41.0060	Free.
Shavings, chips, and mill waste	7204.41.0080	Free.
No. 1 heavy melting steel	7204.49.0020	Free.
No. 2 heavy melting steel	7204.49.0040	Free.
Cut plate and structural	7204.49.0060	Free.
Shredded steel	7204.49.0070	Free.
Other iron and steel	7204.49.0080	Free.
Remelting ingots	7204.50.0000	Free.
Used rails	7302.10.5040	Free.
Vessels and ships	8908.00.0000	Free.

Depletion Allowance: Not applicable.

Government Stockpile: None.

Events, Trends, and Issues: In the first 10 months of 2025, steel mills maintained normal operating rates of 75% to 80% of production capacity utilization, higher than the rates of 72% to 78% in 2024. Average composite prices published for the first 11 months of 2025 for No. 1 heavy melting steel scrap ranged from a high of $366.26 per ton in March to a low of $303.46 per ton in November. The annual average price delivered in 2025 was estimated to increase to $319.00 per ton compared with the full-year average of $314.85 per ton in 2024.

In the first 8 months of 2025, Turkey was the primary destination for exports of ferrous scrap, by tonnage, accounting for 29% of total exports, followed by Bangladesh, 13%, and India, 10%. The value of exported scrap for the same time period decreased to an estimated $3.6 billion in 2025 from $4.5 billion in 2024. In the first 8 months of 2025, Canada was the leading source of imports of ferrous scrap, by tonnage, accounting for 62% of total imports, followed by Mexico, 25%, and the United Kingdom, 4%. The value of imported scrap for the same time period increased to an estimated $1.4 billion in 2025 from $1.3 billion in 2024.

The World Steel Association[6] estimated global finished steel demand to remain unchanged in 2025 owing to declining steel demand in China, offset by growth in developing economies including Egypt, India, Saudi Arabia, and Vietnam. Globally, the manufacturing sector was expected to be affected by affordability pressures on consumers and elevated production costs. Countries with economies reliant on the export of steel-intensive goods were negatively affected by trade tensions.

World Production and Reserves: Because scrap is not mined, the concept of reserves does not apply. World production data for scrap were not available. See the Iron and Steel and Iron Ore chapters.

World Resources: Not applicable. See the Iron Ore chapter.

Substitutes: An estimated 7.8 million tons of direct-reduced iron was consumed in the United States in 2025 as a substitute for iron and steel scrap, compared with 8.1 million tons in 2023.

[e]Estimated. E Net exporter.
[1]See also the Iron and Steel, Iron and Steel Slag, and Iron Ore chapters. The methodology used for reporting consumption, production, and receipts of ferrous scrap was updated. The data were adjusted to reflect an estimation of the U.S. ferrous scrap consumption industry.
[2]Defined as home scrap + purchased scrap + imports – exports ± adjustments for industry stock changes.
[3]Source: Fastmarkets AMM.
[4]Source: U.S. Department of Labor, Bureau of Labor Statistics, North American Industry Classification System code 331500.
[5]Defined as imports – exports ± adjustments for industry stock changes.
[6]Source: World Steel Association, 2025, Worldsteel Short Range Outlook October 2025: Brussels, Belgium, World Steel Association press release, October 13, 3 p. (Accessed November 18, 2025, at https://worldsteel.org/media/press-releases/2025/worldsteel-short-range-outlook-october-2025/.)

IRON AND STEEL SLAG

(Data in million metric tons unless otherwise specified)

Domestic Production and Use: Iron and steel (ferrous) slags are formed by the combination of slagging agents and impurities during the production of crude (or pig) iron and raw steel. The slags are tapped separately from the metals, then cooled and processed, and are primarily used in the construction industry. Granulated slag is produced at a small number of specially equipped blast furnaces by quenching the molten slag with water to produce sand-sized grains of silicate glass. Pelletized slag, a form of expanded slag, is also produced by quenching blast furnace slag with water; though often used as a lightweight aggregate, it is also used in place of granulated slag when finely ground, but very little is produced in the United States. Ground granulated blast furnace slag (GGBFS) is used as a supplementary cementitious material (SCM) that can partially substitute for clinker in finished cement or for some of the portland cement in concrete. Any other slag produced at blast furnaces is air cooled, including some from blast furnaces equipped with granulators if the slag was not suitable for granulation. Air-cooled blast furnace slag (ACBFS) has for many decades been used in place of natural aggregates in concrete and in smaller specialty markets such as glass and mineral wool insulation. ACBFS also shares end uses with steel furnace slag produced in the basic oxygen furnaces (BOFs) at integrated steel mills and at the electric arc furnaces (EAFs) at steel mills that produce steel mainly from scrap metal. Common end uses for ACBFS, and steel slag included asphaltic concrete, fill, and road base. Some iron and steel slags can also be used as a soil conditioner or as filter media in water treatment.

Data were unavailable on actual U.S. ferrous slag production, but slag sales[1] in 2025 were estimated to be 16 million tons valued at about $620 million. Granulated blast furnace slag[2] was less than 30% of the tonnage sold but accounted for about 80% of the total value of slag because of the high value of GGBFS. Steel slag produced from BOFs and EAFs accounted for the remainder of sales. Slag was processed by about 25 companies servicing active iron and steel facilities or reprocessing old slag piles at an estimated 120 processing plants (including some iron and steel plants with more than one slag-processing facility) in 33 States, including facilities that import and grind unground slag to sell as GGBFS.

Prices per ton ranged from a few cents for some steel slags at a few locations to about $140 or more for some GGBFS in 2025. Owing to low unit values, most slag types can be shipped only short distances by truck, but rail and waterborne transportation allow for greater travel distances. Because much higher unit values make it economical to ship GGBFS longer distances, much of the GGBFS consumed in the United States is imported.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production (sales)[e, 1]	16	15	16	16	16
Imports for consumption[e, 3]	2.4	2.2	2.5	2.0	2.1
Exports	([4])	([4])	([4])	([4])	([4])
Consumption, apparent[e, 5]	16	15	16	16	16
Price, average unit value, free on board plant, dollars per metric ton[6]	28	29	36	38	40
Employment, number[e]	1,500	1,500	1,500	1,500	1,500
Net import reliance[7] as a percentage of apparent consumption	14	14	15	12	13

Recycling: Following removal of entrained metal, slag can be returned to the blast and steel furnaces as ferrous and flux feed, but data on these returns are incomplete. Entrained metal, particularly in steel slag, is routinely recovered during slag processing for return to the furnaces and is an important revenue source for slag processors; data on metal returns are unavailable.

Import Sources (2021–24): Japan, 60%; China, 22%; Brazil, 6%; Mexico, 6%; and other, 6%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Granulated slag	2618.00.0000	Free.
Slag, dross, scalings, and other waste from manufacture of iron and steel:		
Ferrous scale	2619.00.3000	Free.
Other	2619.00.9000	Free.

Depletion Allowance: Not applicable.

Government Stockpile: None.

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IRON AND STEEL SLAG

Events, Trends, and Issues: In 2025, the supply of domestic GGBFS increased with the startup of a new granulator in the second quarter of 2025; however, a separate granulator was idled in the second quarter of 2025, keeping the overall number of domestic granulators at four, but at three granulation operations. In 2024, permits were obtained to install granulators for both blast furnaces at another integrated steel mill, underscoring the increasing importance of granulated slag for its use as a SCM in blended cements and in concrete. Startup was expected in 2026. In addition to reducing unit consumption of fuel and limestone in cement plant kilns, which reduces the unit emissions of pollutants such as carbon dioxide, the addition of slag cement in concrete mixtures is advantageous when certain requirements need to be met, such as a lower heat of hydration. Relatively few integrated U.S. steel mills were originally equipped with granulators on their blast furnaces and, for many years as blast furnaces were being shut down, the supply of domestic granulated blast furnace slag decreased; at yearend 2015, there were only two granulators operating. Although the additional granulator capacity coming online was expected to increase the domestic supply, the availability of imported granulated slag was expected to eventually decrease as foreign blast furnaces are shut down in decarbonization efforts and replaced with EAFs or with direct-reduced iron facilities such as one being planned for a major integrated mill in Canada. In addition, the use of fly ash, which is used as an additive in concrete production similar to GGBFS, was expected to increase. Domestic supply from coal-fired powerplants was expected to be stable in the upcoming years, but the quantity of fly ash harvested and beneficiated from landfill storage was expected to increase because utilization is expected to increase. Granulated slag needs to be ground into a fine powder at grinding plants; in Texas, a new slag cement facility became fully operational in February and another slag cement plant was commissioned in the fourth quarter of 2024. In addition, a groundbreaking was held in June for a new slag cement facility being built in Indiana and plans for a new slag grinding plant in Florida were announced in November.

New uses for steel slag were being investigated. In 2024, the U.S. Department of Transportation awarded a grant spanning a 5-year period for research on uses for steel slag in concrete and cement. Typically, ACBFS and GGBFS are used for this purpose, but steel slag is more plentiful. Companies were also working with steel slag in decarbonization efforts, such as using it as a passive absorbent in a carbon dioxide removal process. Additional research investigations involving steel slag included its use in a novel process to treat wastewater and its incorporation into various road construction materials. Plans for a new slag recycler facility were announced for a steel plant in Pennsylvania.

World Production and Reserves: Because slag is not mined, the concept of reserves does not apply. World production data for slag were not available, but iron slag production from blast furnaces was estimated to be 25% to 30% of crude (pig) iron production, and steel furnace slag production was estimated to be 10% to 15% of raw steel production. In 2025, world iron slag production was estimated to be between 330 million and 390 million tons, and steel slag production was estimated to be between 190 million and 290 million tons.

World Resources: Not applicable.

Substitutes: In the construction sector, ferrous slags compete with natural aggregates (crushed stone and construction sand and gravel) but are far less widely available than the natural materials, although macadam of slag can also be used for aggregate material. As a cementitious additive in blended cements and concrete, GGBFS mainly competes with fly ash, metakaolin, and volcanic ash pozzolans. In this respect, GGBFS reduces the amount of portland cement per ton of concrete, thus allowing more concrete to be made per ton of portland cement. Portland-limestone cement can be used instead of GGBFS for the same purpose. Slags (especially steel slag) can be used as a partial substitute for limestone and some other natural raw materials for clinker (cement) manufacture and compete in this use with fly ash and bottom ash. Some other metallurgical slags, such as copper slag, can compete with ferrous slags in some specialty markets, such as a ferrous feed in clinker manufacture, but the supplies of these metallurgical slags are generally much more restricted than ferrous slags.

[e]Estimated.
[1]Processed slag sold during the year, excluding entrained metal.
[2]Data include sales of domestic and imported granulated blast furnace slag.
[3]U.S. Census Bureau data adjusted by the U.S. Geological Survey to remove nonslag materials (such as cenospheres, fly ash, and silica fume) and slags or other residues of other metallurgical industries (especially copper slag), whose unit values are outside the range expected for granulated slag. In some years, tonnages may be underreported.
[4]Less than 100,000 tons.
[5]Defined as sales – exports.
[6]Average of all types of slag. GGBFS has the highest prices because of its cementitious properties. ACBFS averages a higher price than steel slag, but both are generally lower than prices for aggregates except for some special uses.
[7]Defined as imports – exports.

IRON ORE[1]

(Data in thousand metric tons, usable ore, unless otherwise specified)

Domestic Production and Use: In 2025, eight open pit iron ore mines (each with associated concentration and pelletizing plants) in Michigan, Minnesota, and Utah shipped 98% of domestic usable iron ore products for consumption in the steel industry in the United States. The remaining 2% of domestic iron ore products were consumed in nonsteel end uses. In 2025, the United States produced iron ore with an estimated value of $3.38 billion, a 25% decrease from $4.51 billion in 2024. Four iron metallic plants—one direct-reduced iron (DRI) plant in Louisiana and three hot-briquetted iron (HBI) plants in Indiana, Ohio, and Texas—operated during the year to supply steelmaking raw materials with an estimated value of $874 million, a 4% decrease from $914 million in 2024. The United States was estimated to have produced 1.4% and consumed 1.7% of the world's iron ore output.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production:					
Iron ore	49,500	41,000	46,000	45,100	38,000
Iron metallics	5,010	5,240	5,480	5,220	5,200
Shipments	47,700	40,500	46,600	44,200	40,000
Imports for consumption	3,740	3,030	3,540	3,100	4,000
Exports	14,400	11,400	11,100	10,500	7,800
Consumption, apparent[2]	37,100	32,100	39,000	36,800	37,000
Price, average unit value reported by mines, dollars per metric ton	141.78	156.42	120.36	100.10	89
Stocks, mine, dock, and consuming plant, yearend	5,060	5,590	5,030	5,870	3,570
Employment, mine, concentrating and pelletizing plants, number	4,980	4,790	4,810	4,900	4,300
Net import reliance[3] as a percentage of apparent consumption	E	E	E	E	E

Recycling: None. See the Iron and Steel Scrap chapter.

Import Sources (2021–24): Brazil, 58%; Canada, 21%; Sweden, 10%; Chile, 4%; and other, 7%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Iron ores and concentrates:		
Concentrates	2601.11.0030	Free.
Coarse ores	2601.11.0060	Free.
Other ores	2601.11.0090	Free.
Pellets	2601.12.0030	Free.
Briquettes	2601.12.0060	Free.
Sinter	2601.12.0090	Free.
Roasted iron pyrites	2601.20.0000	Free.

Depletion Allowance: 15% (domestic), 14% (foreign).

Government Stockpile: None.

Events, Trends, and Issues: Iron ore production in 2025 was estimated to have decreased owing to the idling of two iron ore mines in March as part of the operating company's strategy to decrease stockpiles. Domestic iron ore production was estimated to be 38 million tons in 2025, a 16% decrease from 45.1 million tons in 2024. Global prices of iron ore averaged a unit value of $99.07 per ton (spot prices for imported iron ore fines, 62% iron content, cost, insurance, and freight, at Tianjin Port, China) in the first 9 months of 2025, a decrease from $112.07 during the same period in 2024. Domestic pig iron production and raw steel production were estimated to have increased to 21 million tons and 82 million tons, respectively, in 2025.

In December 2024, one company announced that construction would restart at a 7-million-ton-per-year-production-capacity iron mine and pelletizing plant project in Minnesota with startup expected in early 2026. In March, another company idled two iron ore mines in Minnesota: one was indefinitely idled and the other was partially idled. The two mines were rated for a combined 10-million-ton-per-year production capacity. In September and October, two companies announced plans to explore rare-earth-element extraction at iron ore deposits. One of the companies was developing an iron ore mine in Nevada with a permit to extract 11.5 million tons per year. The other operates multiple mines in Minnesota and Michigan.

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IRON ORE

The World Steel Association[4] estimated global finished steel demand to remain unchanged in 2025. Global end-use consumption of steel products was affected in 2025 by declining steel demand in China offset by growth in developing economies including Egypt, India, Saudi Arabia, and Vietnam. Globally, the manufacturing sector was affected by affordability pressures on consumers and elevated production costs. Countries with economies reliant on the export of automotive components, machinery, and other steel-intensive goods were negatively affected by trade tensions.

On November 7, 2025, the U.S. Final 2025 List of Critical Minerals was published in the Federal Register (90 FR 50494). The changes in the 2025 list from the prior list published in 2022 (87 FR 10381) were the addition of copper, lead, potash, rhenium, silicon, and silver, based on the U.S. Geological Survey updated methodology for the 2025 list. As required by the Energy Act, public comment and interagency input were requested in response to the draft U.S. list of critical minerals published in the Federal Register (90 FR 41591). Based on that input, boron, metallurgical coal, phosphate, and uranium were also added. Metallurgical coal was added because of its role in the smelting and refining of iron ore into steel at blast furnaces and basic oxygen furnaces.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Canada and Ukraine based on company and Government reports. Reserves for Australia, Chile, China, Iran, Kazakhstan, Mauritania, Mexico, Peru, South Africa, the United States, and "Other countries" were revised based on company and Government reports.

	Mine production				Reserves[5] (million metric tons)	
	Usable ore		Iron content			
	2024	2025[e]	2024	2025[e]	Crude ore	Iron content
United States	45,100	38,000	28,600	24,000	3,600	2,700
Australia	982,000	980,000	607,000	600,000	[6]59,000	[6]27,000
Brazil	428,000	420,000	268,000	260,000	34,000	15,000
Canada	70,000	69,000	42,000	41,000	6,000	2,300
Chile	[e]18,000	19,000	[e]11,000	12,000	3,000	740
China	293,000	290,000	183,000	180,000	17,000	3,000
India	282,000	310,000	175,000	190,000	5,500	3,400
Iran	[e]90,000	93,000	[e]59,000	61,000	4,200	1,500
Kazakhstan	37,000	35,000	11,100	11,000	3,800	1,500
Mauritania	14,300	15,000	8,940	9,300	10,000	4,400
Mexico	7,800	7,700	4,900	4,800	940	520
Peru	19,800	21,000	13,300	14,000	1,800	1,000
Russia	[e]91,000	86,000	[e]53,000	50,000	35,000	14,000
South Africa	[e]64,000	66,000	[e]41,000	42,000	1,200	680
Sweden	[e]25,000	26,000	[e]18,000	18,000	1,300	600
Turkey	[e]17,000	18,000	[e]11,000	11,000	150	99
Ukraine	54,700	52,000	34,000	32,000	[7]6,500	[7]2,300
Other countries	60,700	64,000	34,700	36,000	11,000	6,000
World total (rounded)	2,600,000	2,600,000	1,600,000	1,600,000	200,000	87,000

World Resources:[5] U.S. resources are estimated to be 110 billion tons of usable iron ore containing about 27 billion tons of iron. U.S. resources are mainly low-grade taconite-type ores from the Lake Superior district that require beneficiation and agglomeration prior to commercial use. World resources are estimated to be greater than 900 billion tons of iron ore containing more than 260 billion tons of iron.

Substitutes: The only source of primary iron is iron ore, used directly as direct-shipping ore or converted to briquettes, concentrates, DRI, iron nuggets, pellets, or sinter. DRI, iron nuggets, and scrap are extensively used for steelmaking in electric arc furnaces and in iron and steel foundries. Technological advancements have been made that allow hematite to be recovered from tailings basins and pelletized.

[e]Estimated. E Net exporter. NA Not available.
[1]Data are for iron ore used as a raw material in steelmaking—excluding iron metallics such as DRI, HBI, and iron nuggets—unless otherwise specified. See also the Iron and Steel and the Iron and Steel Scrap chapters.
[2]Defined as production + imports – exports ± adjustments for industry stock changes.
[3]Defined as imports – exports ± adjustments for industry stock changes.
[4]Source: World Steel Association, 2025, worldsteel short range outlook October 2025: Brussels, Belgium, World Steel Association press release, October 13, 3 p.
[5]See Appendix C for resource and reserve definitions and information concerning data sources.
[6]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 24 billion tons of crude ore and 10 billion tons of iron content.
[7]For Ukraine, reserves consist of the A and B categories of the Soviet reserves classification system.

IRON OXIDE PIGMENTS

(Data in metric tons unless otherwise specified)

Domestic Production and Use: Iron oxide pigments (IOPs) were mined domestically by two companies in Alabama and Georgia. Mine production, which was withheld to avoid disclosing company proprietary data, decreased in 2025 from that in 2024. Five companies with eight processing operations processed and sold about 32,000 tons of finished natural and synthetic IOPs with an estimated value of $60 million. End uses for IOPs include, but are not limited to, concrete and other construction products, paint and coatings, ferrites, plastics, and rubber.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Mine production, crude	W	W	W	W	W
Sold or used, finished natural and synthetic IOPs	26,900	38,200	25,100	34,400	32,000
Imports for consumption	189,000	225,000	114,000	162,000	180,000
Exports, pigment grade	12,300	13,800	13,000	8,150	10,000
Consumption, apparent[1]	203,000	249,000	126,000	189,000	200,000
Price, average unit value, dollars per kilogram[2]	1.03	1.92	2.03	1.85	1.90
Employment, mine and mill, number	43	45	44	37	38
Net import reliance[3] as a percentage of apparent consumption	87	85	80	82	84

Recycling: None.

Import Sources (2021–24): Natural: Cyprus, 51%; France, 23%; Austria, 18%; Belgium, 3%; and other, 5%. Synthetic: China,[4] 44%; Germany, 30%; Brazil, 8%; Canada, 6%; and other, 12%. Total: China,[4] 44%; Germany, 30%; Brazil, 7%; Canada, 6%; and other, 13%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Natural:		
Micaceous iron oxides	2530.90.2000	2.9% ad valorem.
Earth colors	2530.90.8015	Free.
Iron oxides and hydroxides containing 70% or more by weight Fe_2O_3:		
Synthetic:		
Black	2821.10.0010	3.7% ad valorem.
Red	2821.10.0020	3.7% ad valorem.
Yellow	2821.10.0030	3.7% ad valorem.
Other	2821.10.0040	3.7% ad valorem.
Earth colors	2821.20.0000	5.5% ad valorem.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

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IRON OXIDE PIGMENTS

Events, Trends, and Issues: IOPs are a primary choice for colorant for coatings and construction materials because of their chemical and thermal stability, color strength, low cost, and weather resistance. In the United States, automobile production, which uses IOPs for paints and coatings, decreased by 11% during the first 7 months of 2025 compared with the same period in 2024. New privately owned housing starts (not seasonally adjusted), which use IOPs to color concrete block and brick, ready-mixed concrete, and roofing tiles, increased by 1% during the first 8 months of 2025 compared with those in the same period in 2024. IOPs also are used in paints and coatings for the aerospace and marine industries.

Less than 2% of IOP imports were natural pigments, similar to that in all other years in the past decade. Imports of natural and synthetic pigments were estimated to have increased by 11% in 2025 compared with those in 2024. Exports of pigment-grade IOPs were estimated to have increased by 23% in 2025 compared with those in 2024, primarily owing to increase in exports of synthetic pigments. Approximately 37% of pigment-grade IOPs exports went to Mexico; the other leading destination countries for exports were China (23%), Belgium (12%), and Chile (8%).

World Mine Production and Reserves: Significant revisions were made to the 2024 production for France and Pakistan based on Government reports.

	Mine production[e]		Reserves[5]
	2024	2025	
United States	W	W	Moderate
Cyprus	21,000	22,000	Moderate
France	12,000	13,000	NA
Germany[6]	[7]276,000	280,000	Moderate
India (ocher)	3,300,000	3,400,000	37,000,000
Italy	31,000	32,000	NA
Pakistan (ocher)	79,000	80,000	Large
Spain (ocher and red iron oxide)	18,000	19,000	Large
World total (rounded)	[8]NA	[8]NA	Large

World Resources:[5] Domestic and world resources for production of IOPs are adequate. Adequate resources are available worldwide for the manufacture of synthetic IOPs.

Substitutes: Milled IOPs are estimated to be the most commonly used natural minerals for pigments. Because IOPs are color stable, low cost, and nontoxic, they can be economically used for imparting black, brown, red, and yellow coloring in large and relatively low-value applications. Other minerals may be used as colorants, but they generally cannot compete with IOPs because of their higher costs and more limited availability. Synthetic IOPs are widely used as colorants and compete with natural IOPs in many color applications. Organic colorants are used for some colorant applications, but many of the organic compounds fade over time from exposure to sunlight.

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data.
[1]Defined as sold or used, finished natural and synthetic iron oxide pigments + imports – exports.
[2]Average unit value for finished iron oxide pigments sold or used by U.S. producers.
[3]Defined as imports – exports.
[4]Includes Hong Kong.
[5]See Appendix C for resource and reserve definitions and information concerning data sources.
[6]Includes natural and synthetic iron oxide pigments.
[7]Reported.
[8]Several other countries, including Austria, Azerbaijan, Brazil, China, Honduras, Iran, Kazakhstan, Lithuania, Paraguay, Russia, South Africa, Turkey, Ukraine, and the United Kingdom, may have produced iron oxide pigments, but available information was inadequate to make reliable estimates of output.

KYANITE AND RELATED MINERALS

(Data in metric tons unless otherwise specified)

Domestic Production and Use: In Virginia, one firm with integrated mining and processing operations produced an estimated 80,000 tons of kyanite worth $40 million from two hard-rock open pit mines and synthetic mullite by calcining kyanite. Two other companies, one in Alabama and another in Georgia, produced synthetic mullite from materials mined from four sites; each company sourced materials from one site in Alabama and one site in Georgia. Synthetic mullite production data were withheld to avoid disclosing company proprietary data. Commercially produced synthetic mullite is made by sintering or fusing such feedstock materials as kyanite, kaolin, bauxite, or bauxitic kaolin. Natural mullite occurrences typically are rare and not economical to mine.

Of the kyanite-mullite output, 90% was estimated to have been used in refractories and 10% in other uses, including abrasive products, such as motor vehicle brake shoes and pads and grinding and cutting wheels; ceramic products, such as electrical insulating porcelains, sanitaryware, and whiteware; foundry products and precision casting molds; and other products. An estimated 60% to 70% of the refractory use was by the iron and steel industries, and the remainder was used by industries that manufacture cement, chemicals, glass, nonferrous metals, and other materials.

Andalusite was commercially mined from an andalusite-pyrophyllite-sericite deposit in North Carolina and processed as a blend of primarily andalusite for use by producers of refractories in making firebrick. Another company mined mineral sands in the southeastern United States; product blends that included kyanite and (or) sillimanite were marketed to the abrasive, foundry, and refractory industries.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production:					
Kyanite, mine	[1]105,000	[1]85,900	[1]82,400	[1]78,600	80,000
Synthetic mullite	W	W	W	W	W
Imports for consumption (all kyanite minerals)	1,390	7,630	5,020	5,940	2,700
Exports (kyanite)	48,000	51,600	42,800	40,400	37,000
Consumption, apparent[2]	58,400	41,900	44,600	44,100	46,000
Price, average unit value of exports (free alongside ship),[3, 4] dollars per metric ton	369	382	428	460	510
Employment, number:[e, 5]					
Kyanite, mine, office, and plant	140	140	140	140	140
Synthetic mullite, office and plant	200	200	200	200	200
Net import reliance[6] as a percentage of apparent consumption	E	E	E	E	E

Recycling: Insignificant.

Import Sources (2021–24):[4] South Africa, 54%; Peru, 24%; France, 18%; and United Kingdom, 4%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Andalusite, kyanite, and sillimanite	2508.50.0000	Free.
Mullite	2508.60.0000	Free.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile: None.

Events, Trends, and Issues: Crude steel production in the United States, which ranked third in the world, increased by 1.6% to 54.6 million tons in the first 8 months of 2025 compared with that in the same period in 2024, indicating a similar change in consumption of kyanite-mullite refractories. Global crude steel production decreased by 1.7% to 1,231 million tons during the first 8 months of 2025 compared with that in the same period in 2024. Decreased global crude steel production during the first 8 months of 2025 was partially attributed to decreased demand from end-use sectors. The steel industry continued to be the leading consumer of refractories.

In January 2025, an Austria-based company finalized its acquisition of a United States-based producer of refractory products and associated minerals. In April 2025, an updated inferred mineral resource assessment was announced for a heavy-mineral-sand project in Cameroon that included an estimate for kyanite. The results of test work on the kyanite sample data were compared with kyanite sample data from Virginia.

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KYANITE AND RELATED MINERALS

Andalusite supply remained constrained globally. Over the previous several years, andalusite mines in South Africa were adversely affected by electricity supply disruptions, flooding, labor disputes, and shipping problems. In 2025, exports from South Africa were estimated to be less than those reported in 2024. In Peru, andalusite production in 2025 was estimated to have been unchanged from that in 2024, but output was not expected to meet demand. Andalusite exports from China were estimated to be less than 7,000 tons, significantly less than those reported from other andalusite-producing countries such as France and Peru. Iran produced andalusite from three andalusite-garnet mines, but information was not available to make a reliable estimate of output.

In India, mining of new groups of minerals, including andalusite, was approved by the Government, but some sillimanite mines had previously been reclassified as beach sand minerals mines and, as a result, those mines were no longer considered sillimanite-producing mines. The State government of Tamil Nadu banned beach sand mining in 2013 and in 2025, an investigation into alleged unlawful mining of beach sand minerals such as garnet, ilmenite, monazite, rutile, sillimanite, and zircon was initiated. Five companies were ordered to make payments toward the cost of the minerals and royalties as part of the recovery proceedings. The Government of India banned private sector beach sand mining in 2019, but some sillimanite was produced in association with kyanite-producing mines.

If andalusite producers are unable to meet demand, market participants may consider alternate materials, such as refractory-grade bauxite and mullite. Similarly, when refractory-grade bauxite supply is limited, market participants may consider andalusite for specific refractory applications. Recycled refractory materials may also be used more often moving forward than they were in 2025.

World Mine Production and Reserves: Production in 2024 for China was revised significantly based on Government reports. Reserves for India were revised based on Government reports.

	Mine production[e]		Reserves[7]
	2024	2025	
United States (kyanite)	[1]78,600	80,000	Large
China (andalusite, crude ore)	50,000	50,000	5,000,000
France (andalusite)	60,000	60,000	NA
India (kyanite and sillimanite)	[8]2,710	2,500	9,100,000
Peru (andalusite)	40,000	40,000	NA
South Africa (andalusite)	130,000	120,000	NA
World total (rounded)[9, 10]	XX	XX	XX

World Resources:[7] Large resources of kyanite and related minerals are known to exist in the United States. The chief resources are in deposits of micaceous schist and gneiss, mostly in the Appalachian Mountains and in Idaho. Other resources are in aluminous gneiss in southern California. These resources are not economical to mine at present. The characteristics of kyanite resources in the rest of the world are estimated to be similar to those in the United States. Significant resources of andalusite are known to exist in China, France, Peru, and South Africa; kyanite resources have been identified in Brazil, India, and Russia; and sillimanite has been identified in India.

Substitutes: Two types of synthetic mullite (fused and sintered), superduty fire clays, and high-alumina materials are substitutes for kyanite in refractories. Principal raw materials for synthetic mullite are bauxite, kaolin and other clays, and silica sand.

[e]Estimated. E Net exporter. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Source: Virginia Department of Energy.
[2]Defined as kyanite production + imports of kyanite minerals – exports of kyanite minerals.
[3]Calculated from U.S. Census Bureau export data.
[4]Includes data for the following Harmonized Tariff Schedule of the United States code: 2508.50.0000.
[5]Estimated based on data from the U.S. Department of Labor, Mine Safety and Health Administration.
[6]Defined as imports – exports.
[7]See Appendix C for resource and reserve definitions and information concerning data sources.
[8]Reported.
[9]In addition to the countries and (or) localities listed, Brazil, China, and Iran may have produced kyanite and related materials, but information was not available to make reliable estimates of output.
[10]World totals cannot be calculated because production and reserves are not reported in a consistent manner by all countries.

LEAD

(Data in thousand metric tons, lead content, unless otherwise specified)

Domestic Production and Use: Lead was produced domestically by five lead mines in Missouri plus as a byproduct at two zinc mines in Alaska and two silver mines in Idaho. The value of recoverable lead from ore mined in 2025 was an estimated $650 million, 8% less than that in 2024. Nearly all lead concentrate production has been exported since the last primary lead refinery closed in 2013. The value of the secondary lead produced in 2025 was $2.4 billion, a 4% decrease from that in 2024. The lead-acid battery industry accounted for an estimated 67% of U.S. apparent consumption of lead during 2025. Lead-acid batteries were primarily used as starting-lighting-ignition (SLI) batteries for automobiles, as industrial-type batteries for standby power for computer and telecommunications networks, and for motive power.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production:					
Mine, lead in concentrates	294	273	270	304	280
Mine, recoverable lead	286	264	263	296	270
Primary refinery	—	—	—	—	—
Secondary refinery, old scrap	1,050	1,010	1,010	1,030	1,000
Imports for consumption:					
Lead in concentrates	1	([1])	([1])	([1])	([1])
Refined metal, unwrought	614	652	519	410	520
Exports:					
Lead in concentrates	262	255	246	260	220
Refined metal, unwrought (gross weight)	22	26	23	37	22
Consumption, apparent[2]	1,640	1,630	1,500	1,410	1,500
Price, average, North American, cents per pound[3]	113.0	116.5	114.1	108.8	106
Net import reliance[4] as a percentage of apparent consumption, refined metal	36	38	33	27	33

Recycling: In 2025, an estimated 1 million tons of secondary lead was produced, an amount equivalent to 70% of apparent domestic consumption. Nearly all secondary lead was recovered from old scrap, mostly lead-acid batteries.

Import Sources (2021–24): Refined metal: Canada, 31%; Republic of Korea, 16%; Mexico, 15%; Australia, 13%; and other, 25%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Lead ores and concentrates, lead content	2607.00.0020	1.1¢/kg on lead content.
Refined lead	7801.10.0000	2.5% on the value of the lead content.
Antimonial lead	7801.91.0000	2.5% on the value of the lead content.
Alloys of lead	7801.99.9030	2.5% on the value of the lead content.
Other unwrought lead	7801.99.9050	2.5% on the value of the lead content.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile: None.

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LEAD

Events, Trends, and Issues: During the first 10 months of 2025, the average North American price for lead was 106 cents per pound, 3% less than the annual average price of 108.8 cents per pound in 2024. Global stocks of lead in LME-approved warehouses were 217,000 tons at the end of October, 10% less than those at yearend 2024.

In 2025, domestic mine production of recoverable lead decreased by 9% from that in 2024 owing to several lead-producing mines reducing production. Estimated U.S. apparent consumption of refined lead increased by 8% from that in 2024, and the net import reliance increased to 33% from 27%. In the first 8 months of 2025, 23 million spent SLI lead-acid batteries were exported, a 23% increase from 19 million batteries exported in the same period in 2024.

According to the International Lead and Zinc Study Group,[5] global refined lead production in 2025 was forecast to increase slightly to 13.3 million tons and refined lead consumption to increase slightly to 13.25 million tons.

On November 7, 2025, the U.S. Final 2025 List of Critical Minerals was published in the Federal Register (90 FR 50494). The changes in the 2025 list from the prior list published in 2022 (87 FR 10381) were the addition of copper, lead, potash, rhenium, silicon, and silver, based on the U.S. Geological Survey updated methodology for the 2025 list. As required by the Energy Act, public comment and interagency input were requested in response to the draft U.S. list of critical minerals published in the Federal Register (90 FR 41591). Based on that input, boron, metallurgical coal, phosphate rock, and uranium were also added.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Bolivia and Mexico based on company and Government reports. Reserves for Australia were revised based on a Government report.

	Mine production		Reserves[6]
	2024	2025[e]	
United States	304	280	4,600
Australia	[e]481	480	[7]34,000
Bolivia	110	100	1,600
China	1,940	1,900	22,000
India	[e]226	220	1,900
Iran	[e]70	70	2,000
Mexico	240	200	5,600
Peru	291	290	5,000
Russia	260	260	8,900
Sweden	75	70	1,700
Tajikistan	[e]39	40	NA
Turkey	[e]66	70	1,600
Other countries	498	500	5,900
World total (rounded)	4,600	4,500	95,000

World Resources:[6] Identified world lead resources total more than 2 billion tons. In recent years, significant lead resources have been identified in association with zinc and (or) silver or copper deposits in Australia, China, Ireland, Mexico, Peru, Portugal, Russia, and the United States (Alaska).

Substitutes: Substitution by plastics has reduced the use of lead in cable covering and cans. Tin has replaced lead in solder for potable water systems. The electronics industry has moved toward lead-free solders and flat-panel displays that do not require lead shielding. Steel and zinc are common substitutes for lead in wheel weights.

[e]Estimated. NA Not available. — Zero.
[1]Less than ½ unit.
[2]Defined as secondary refined production from old scrap + refined imports – refined exports.
[3]Source: S&P Global Platts Metals Week.
[4]Defined as refined imports – refined exports.
[5]Source: International Lead and Zinc Study Group, 2025, ILZSG session/forecasts: Lisbon, Portugal, International Lead and Zinc Study Group press release, October 13, [4] p.
[6]See Appendix C for resource and reserve definitions and information concerning data sources.
[7]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 10 million tons.

LIME[1]

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: In 2025, an estimated 15 million tons of quicklime and hydrated lime was produced (excluding independent commercial hydrators[2]), valued at about $4.0 billion. Lime was produced by 24 companies—16 with commercial sales and 8 that produced lime strictly for internal use (for example, sugar companies). These companies had 70 primary lime plants (plants operating quicklime kilns) in 30 States. Of the 24 companies, 3 operated only hydrating plants in eight States. In 2025, the five leading U.S. lime companies produced quicklime or hydrated in 23 States and accounted for about 80% of U.S. lime production. The leading producing States were Alabama, Missouri, Ohio, and Texas. Major markets for lime were, in descending order of consumption, steelmaking, chemical and industrial applications (such as the manufacture of fertilizer, glass, paper and pulp, and precipitated calcium carbonate, and in sugar refining), flue gas treatment, construction, water treatment, and nonferrous-metal mining.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production[2, 3]	16,600	16,700	15,800	15,000	15,000
Imports for consumption	323	354	343	362	360
Exports	335	304	344	331	280
Consumption, apparent[4]	16,600	16,800	15,800	15,000	15,000
Price, average value, dollars per metric ton at plant:					
Quicklime	132.8	149.9	184.6	261.4	260
Hydrated	158.0	179.1	234.6	274.2	280
Net import reliance[5] as a percentage of apparent consumption	E	<1	E	<1	<1

Recycling: Large quantities of lime are regenerated by paper mills. Some municipal water-treatment plants regenerate lime from softening sludge. Quicklime is regenerated from waste hydrated lime in the carbide industry. Data for these sources were not included as production to avoid double counting.

Import Sources (2021–24): Canada, 76%; Mexico, 19%; and other, 5%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Calcined dolomite	2518.20.0000	3% ad valorem.
Quicklime	2522.10.0000	Free.
Slaked lime	2522.20.0000	Free.
Hydraulic lime	2522.30.0000	Free.

Depletion Allowance: Limestone produced and used for lime production, 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: In 2025, domestic lime production was estimated to be unchanged from that in 2024. In July, a sugar company shut down its sugar beet facility in Brawley, CA, which included the closure of its quicklime kiln. In 2025, a total of 70 quicklime plants were in operation along with 11 hydrating plants. Hydrated lime is a dry calcium hydroxide powder made from reacting quicklime with a controlled amount of water in a hydrator. It is used in chemical and industrial, construction, and environmental applications.

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LIME

World Lime Production and Limestone Reserves:

	Production[6] 2024	Production[6] 2025[e]	Reserves[7]
United States	15,000	15,000	Adequate for all countries with listed production.
Australia	1,890	1,900	
Belgium[8]	1,100	1,100	
Brazil	8,200	8,200	
Bulgaria	1,300	1,300	
Canada	1,550	1,600	
China	310,000	310,000	
France	3,500	3,500	
Germany	4,800	4,800	
India	17,000	17,000	
Iran	4,000	4,000	
Italy[8]	2,500	2,500	
Japan (quicklime only)	5,870	5,900	
Korea, Republic of	5,000	5,000	
Malaysia	1,400	1,400	
Poland (hydrated and quicklime)	1,290	1,300	
Russia (industrial and construction)	11,800	12,000	
South Africa	1,000	1,000	
Spain	1,700	1,700	
Turkey	4,000	4,000	
Ukraine	1,100	1,100	
United Kingdom	1,300	1,300	
Other countries	16,200	16,000	
World total (rounded)	421,000	420,000	

World Resources:[7] Domestic and world resources of limestone and dolomite suitable for lime manufacture are very large.

Substitutes: Limestone is a substitute for lime in many applications, such as agriculture, fluxing, and sulfur removal. Limestone, which contains less reactive material, is slower to react and may have other disadvantages compared with lime, depending on the application; however, limestone is considerably less expensive than lime. Calcined gypsum is an alternative material in industrial plasters and mortars. Cement, cement kiln dust, fly ash, and lime kiln dust are potential substitutes for some construction uses of lime. Magnesium hydroxide is a substitute for lime in pH control, and magnesium oxide is a substitute for dolomitic lime as a flux in steelmaking.

[e]Estimated. E Net exporter.
[1]Data are for quicklime, hydrated lime, and refractory dead-burned dolomite. Includes Puerto Rico.
[2]To avoid double counting quicklime production, excludes independent commercial hydrators that purchase quicklime for hydration.
[3]Sold or used by producers.
[4]Defined as production + imports – exports. Includes some double counting based on nominal, undifferentiated reporting of company export sales as U.S. production.
[5]Defined as imports – exports.
[6]Only countries that produced 1 million tons or more of lime are listed separately.
[7]See Appendix C for resource and reserve definitions and information concerning data sources.
[8]Includes hydraulic lime.

LITHIUM

(Data in metric tons, lithium content, unless otherwise specified)

Domestic Production and Use: Commercial-scale lithium production in the United States was from a continental brine operation in Nevada. Two companies produced a wide range of downstream lithium compounds in the United States from domestic or imported lithium carbonate, lithium chloride, and lithium hydroxide. Domestic production data were withheld to avoid disclosing company proprietary data.

Although lithium uses vary by location, global end uses were estimated as follows: batteries, 88%; ceramics and glass, 4%; lubricating greases, 2%; air treatment, 1%; continuous casting mold flux powders, 1%; medical, 1%; and other uses, 3%. Lithium consumption for batteries increased significantly owing to the use of rechargeable lithium batteries in the growing market for electric vehicles (EVs), energy grid storage applications, portable electronic devices, and electric tools. Lithium minerals were used directly as mineral concentrates in ceramics and glass applications.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production	W	W	W	W	W
Imports for consumption	2,640	3,260	3,390	3,020	3,800
Exports	1,870	2,440	1,960	1,690	2,000
Consumption, apparent[1]	W	W	W	W	W
Price, annual average-real, battery-grade lithium carbonate, dollars per metric ton[2]	11,700	63,700	39,000	11,800	9,000
Employment, mine and mill, number	70	70	70	70	70
Net import reliance[3] as a percentage of apparent consumption	>25	>25	>50	>50	>50

Recycling: Construction of lithium battery recycling plants continued throughout 2025. Automobile companies and battery recyclers partnered to supply the automobile industry with a source of battery materials.

Import Sources (2021–24): Chile, 54%; Argentina, 43%; and other, 3%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Lithium oxide and hydroxide	2825.20.0000	3.7% ad valorem.
Lithium carbonate:		
U.S. pharmaceutical grade	2836.91.0010	3.7% ad valorem.
Other	2836.91.0050	3.7% ad valorem.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile: Not available.

Events, Trends, and Issues: Excluding U.S. production, worldwide lithium production in 2025 increased by 31% to approximately 290,000 tons from 222,000 tons in 2024 in response to strong demand from the lithium-ion battery market, high lithium prices from 2021 to early 2023, and an increase in global lithium production capacity. Global consumption of lithium in 2025 was estimated to be 263,000 tons, a 20% increase from consumption of 220,000 tons in 2024. Concern about a short-term lithium oversupply kept prices low during the first half of 2025. However, considerable EV sales growth in China and Europe and increased demand for battery energy storage systems contributed to lithium price increases during the second half of 2025.

Spot lithium carbonate prices in China [cost, insurance, and freight (c.i.f.)] increased from approximately $9,300 per ton in January to approximately $10,300 per ton in November. For fixed contracts, the annual average U.S. lithium carbonate price was $9,000 per ton in 2025, a decrease of 31% from that in 2024. Spot lithium hydroxide prices in China [free on board (f.o.b.)] increased from approximately $10,300 per ton in January to approximately $11,200 per ton in November. Spodumene (6% lithium oxide) prices in Australia (f.o.b.) increased from approximately $800 per ton in January to approximately $970 per ton in November.

Four brine operations in Argentina, seven mineral operations in Australia, one mineral operation in Brazil, two mineral operations in Canada, two brine operations Chile, nine mineral and six brine operations in China, two mineral operations in Mali, and five mineral operations in Zimbabwe accounted for the majority of world lithium production. Additionally, smaller operations in Argentina, Brazil, China, Portugal, and the United States also contributed to world lithium production. Namibia temporarily removed from mine production owing to legal uncertainties. Despite some lithium producers reducing output or expansion projects being postponed in 2025 owing to low prices, significant production capacity expansions took place in Argentina, Brazil, Canada, Chile, China, Mali, the United States, and Zimbabwe.

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LITHIUM

Lithium supply security has become a priority for technology companies in Asia, Europe, and North America. Strategic alliances and joint ventures among technology companies and exploration companies continued to be established to ensure a reliable, diversified supply of lithium for battery suppliers and vehicle manufacturers. Brine-based lithium sources were in various stages of development or exploration in Argentina, Bolivia, Canada, Chile, China, and the United States; mineral-based lithium sources were in various stages of development or exploration in Australia, Austria, Brazil, Canada, China, Congo (Kinshasa), Czechia, Ethiopia, Finland, France, Germany, Ghana, India, Iran, Kazakhstan, Mali, Namibia, Nigeria, Peru, Portugal, Russia, Rwanda, Serbia, Spain, Thailand, Turkey, the United Kingdom, the United States, and Zimbabwe; lithium-clay sources were in various stages of development or exploration in Mexico and the United States.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Argentina based on company reports and for Mali based on two new operations started in 2024. Reserves for Argentina, Australia, Brazil, Canada, Chile, China, the United States, and Zimbabwe were revised based on company and Government reports.

	Mine production[e]		Reserves[4]
	2024	2025	
United States	W	W	4,400,000
Argentina	[5]13,800	23,000	4,400,000
Australia	82,700	92,000	[6]8,400,000
Brazil	10,200	12,000	540,000
Canada	4,820	5,600	1,600,000
Chile	[5]48,900	56,000	9,200,000
China	41,400	62,000	4,600,000
Mali	770	9,400	370,000
Portugal	380	380	60,000
Zimbabwe	20,000	28,000	500,000
Other countries[7]	—	—	2,400,000
World total (rounded)	[8]222,000	[8]290,000	37,000,000

World Resources:[4] Owing to continuing exploration, measured and indicated lithium resources have increased substantially worldwide and total about 150 million tons. Measured and indicated lithium resources in the United States—from continental brines, claystone, geothermal brines, hectorite, oilfield brines, and pegmatites—are 30 million tons. Measured and indicated lithium resources in other countries have been revised to 120 million tons. Resources are distributed as follows: Argentina, 28 million tons; Bolivia, 23 million tons; Chile, 13 million tons; Australia, 10 million tons; China, 10 million tons; Germany, 8.9 million tons; Canada, 8.1 million tons; Congo (Kinshasa), 3 million tons; Mexico, 1.7 million tons; Brazil, 1.4 million tons; Czechia, 1.3 million tons; Mali, 1.2 million tons; Serbia, 1.2 million tons; France, 1 million tons; Peru, 1 million tons; Russia, 1 million tons; Zimbabwe, 860,000 tons; Spain, 320,000 tons; Portugal, 260,000 tons; Namibia, 230,000 tons; Ghana, 200,000 tons; United Kingdom, 61,000 tons; Austria, 60,000 tons; Finland, 55,000 tons; and Kazakhstan, 45,000 tons.

Substitutes: Substitution for lithium compounds is possible in batteries, ceramics, greases, and manufactured glass. Examples are calcium, magnesium, mercury, and zinc as anode material in primary batteries; calcium and aluminum soaps as substitutes for stearates in greases; and sodic and potassic fluxes in ceramics and glass manufacture.

[e]Estimated. W Withheld to avoid disclosing company proprietary data. — Zero.
[1]Defined as production + imports – exports ± adjustments for industry stock changes.
[2]Lithium carbonate price assessments for spot and long-term contracts. Source: Benchmark Mineral Intelligence Ltd.
[3]Defined as imports – exports ± adjustments for industry stock changes.
[4]See Appendix C for resource and reserve definitions and information concerning data sources.
[5]Reported.
[6]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 5.1 million tons.
[7]Other countries with reported reserves include Austria, Congo (Kinshasa), Czechia, Finland, Germany, Ghana, Mexico, Namibia, Serbia, and Spain.
[8]Excludes U.S. production.

MAGNESIUM COMPOUNDS[1]

[Data in thousand metric tons, magnesium oxide (MgO) content,[2] unless otherwise specified]

Domestic Production and Use: In 2025, most U.S. magnesium compounds were produced from seawater and natural brines. The value of shipments of all types of magnesium compounds (excluding magnesium chloride) was estimated to be $350 million compared with $349 million in 2024. Magnesium compounds were recovered from seawater by one company in California and another company in Delaware, from well brines by one company in Michigan, and from lake brines by two companies in Utah. Magnesite was mined by one company in Nevada. One company in Washington sold and processed stockpiled olivine. In July, a U.S. magnesia producer acquired another manufacturer of magnesia-based products that operated a magnesite mine in Nevada.

In the United States, about 78% of magnesium compounds were consumed in the form of caustic-calcined magnesia, magnesium chloride, magnesium hydroxide, and magnesium sulfates across the following industries and uses, in descending order of quantity, environmental, deicing, chemical, and agricultural. The remaining magnesium compounds were consumed for refractories in the form of dead-burned magnesia, fused magnesia, and olivine.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production	432	412	428	398	400
Shipments (gross weight)	634	606	616	674	680
Imports for consumption	647	591	490	496	640
Exports	95	104	89	62	60
Consumption, apparent[3]	984	899	830	832	980
Employment, plant, number[e]	270	280	270	270	280
Net import reliance[4] as a percentage of apparent consumption	56	54	48	52	59

Recycling: Some magnesia-based refractories are recycled as construction aggregate, reused in refractory, and as foundry sand.

Import Sources (2021–24): Caustic-calcined magnesia: China,[5] 74%; Canada, 21%; and other, 5%. Crude magnesite: China,[5] 91%; Japan, 5%; and other, 4%. Dead-burned and fused magnesia: China,[5] 69%; Brazil, 17%; and other, 14%. Magnesium chloride: Israel, 56%; Netherlands, 21%; Austria, 7%; and other, 16%. Magnesium hydroxide: Mexico, 61%; Netherlands, 14%; Israel, 13%; and other, 12%. Magnesium sulfates: China,[5] 53%; Germany, 12%; India, 11%; Mexico, 7%; and other, 17%. Total imports: China,[5] 58%; Brazil, 8%; Canada, 8%; Israel, 8%; and other, 18%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Crude magnesite	2519.10.0000	Free.
Dead-burned and fused magnesia	2519.90.1000	Free.
Caustic-calcined magnesia	2519.90.2000	Free.
Kieserite	2530.20.1000	Free.
Epsom salts	2530.20.2000	Free.
Magnesium hydroxide and peroxide	2816.10.0000	3.1% ad valorem.
Magnesium chloride	2827.31.0000	1.5% ad valorem.
Magnesium sulfate (synthetic)	2833.21.0000	3.7% ad valorem.

Depletion Allowance: Brucite, 10% (domestic and foreign); dolomite, magnesite, and magnesium carbonate, 14% (domestic and foreign); magnesium chloride (from brine wells), 5% (domestic and foreign); and olivine, 22% (domestic) and 14% (foreign).

Government Stockpile: None.

Events, Trends, and Issues: In 2025, China was the leading producer and principal source of magnesia and magnesite imports to the United States. Based on domestic import data for the year through August, imports from China of caustic-calcined magnesia increased by 66% to 201,000 tons, and imports of dead-burned and fused magnesias from China increased by 9% to 77,200 tons compared with those in the same period in 2024. According to an industry study, most of China's magnesia and magnesite production were concentrated in Liaoning Province. In recent years, the Provincial government has issued guidance that aimed to consolidate the sector and manage output. From 2020 through 2024, the number of magnesite-mining enterprises in Liaoning decreased from 114 to 63, with further consolidation expected to reduce the number of operators to 56 by yearend 2025.

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MAGNESIUM COMPOUNDS

In October, 14,000 tons of magnesite was mined and shipped to a Japan-based steel refiner from a trial open pit mine in Australia. The producer expects to develop an open pit magnesite mine with a crushing and screening plant and a kiln to process the ore to downstream magnesium oxide.

World Magnesite Mine Production and Reserves (gross weight):[6] Significant revisions were made to the 2024 production for Canada, Greece, India, Russia, and Turkey based on company and Government reports. Reserves for China were revised based on Government reports. In addition to magnesite reserves, vast reserves of magnesium exist in well and lake brines and seawater from which magnesium compounds can be recovered.

	Mine production[e]		Reserves[7]
	2024	2025	
United States	W	W	35,000
Australia	410	400	[8]280,000
Austria	664	650	49,000
Brazil	1,850	1,800	200,000
Canada	230	230	NA
China	12,900	12,700	700,000
Greece	134	130	280,000
India	[9]117	85	66,000
Iran	200	200	10,000
Russia	1,690	1,700	2,300,000
Slovakia	[9]334	330	1,200,000
Spain	655	640	35,000
Turkey	[9]1,600	1,600	110,000
Other countries	341	340	2,500,000
World total (rounded)	[10]21,100	[10]21,000	7,800,000

World Resources:[7] Resources from which magnesium compounds can be recovered range from large to virtually unlimited and are globally widespread. Identified world magnesite and brucite resources total 13 billion tons and several million tons, respectively. Resources of dolomite, forsterite, magnesium-bearing evaporite minerals, and magnesia-bearing brines are estimated to constitute a resource of billions of tons. Magnesium hydroxide can be recovered from seawater. Serpentine could be used as a source of magnesia but global resources, including in tailings of asbestos mines, have not been quantified but are estimated to be very large.

Substitutes: Alumina, chromite, and silica substitute for magnesia in some refractory applications.

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data.
[1]See also the Magnesium Metal chapter.
[2]Reported as magnesium content through Mineral Commodity Summaries 2016. Based on input from consumers, producers, and others involved in the industry, reporting magnesium compound data in terms of magnesium oxide (MgO) content was determined to be more useful than reporting in terms of magnesium content. Calculations were made using MgO contents: magnesite, 47.8%; magnesium chloride, 42.3%; magnesium hydroxide, 69.1%; and magnesium sulfate, 33.5%.
[3]Defined as production + imports – exports.
[4]Defined as imports – exports.
[5]Includes Hong Kong.
[6]Gross weight of magnesite (magnesium carbonate) in thousand tons.
[7]See Appendix C for resource and reserve definitions and information concerning data sources.
[8]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 37 million tons.
[9]Reported.
[10]Excludes U.S. production.

MAGNESIUM METAL[1]

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: One company in Utah had a smelter to recover primary magnesium from brines from the Great Salt Lake in Utah by an electrolytic process but production was reported to have stopped in 2022. Secondary magnesium was recovered from scrap at smelters that produced magnesium ingot and castings and from aluminum alloy scrap at secondary aluminum smelters. In 2025, an estimated 69% of primary magnesium consumption was used in castings, principally for the automotive industry. Aluminum-base alloys that were used for packaging, transportation, and other applications accounted for an estimated 15% of consumption; desulfurization of iron and steel, 9%; and all other uses, 7%. About 58% of secondary magnesium was estimated to be used in aluminum alloys, and about 42% was consumed for structural uses.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production:					
Primary	W	W	—	—	—
Secondary (new and old scrap)	103	115	108	109	110
Imports for consumption	50	107	93	70	82
Exports	10	9	5	5	3
Consumption:					
Reported, primary	48	50	53	46	40
Apparent[2]	W	W	W	W	W
Price, annual average:[3]					
U.S. spot Western, dollars per pound	3.53	7.59	4.98	3.52	3.20
European free market, dollars per metric ton	5,011	5,206	3,240	2,850	2,500
Stocks, producer, yearend	W	W	W	W	W
Employment, number[e]	400	400	200	200	—
Net import reliance[4] as a percentage of apparent consumption	>25	>75	>75	>50	>75

Recycling: In 2025, about 26,000 tons of secondary magnesium was recovered from old scrap and 82,000 tons was recovered from new scrap. Aluminum-base alloys accounted for about 53% of the secondary magnesium recovered, and magnesium-based castings, ingot, and other materials accounted for about 47%.

Import Sources (2021–24): Magnesium metal (99.8% purity): Israel, 47%; Turkey, 31%; Russia, 8%; China, 6%; and other, 8%. Magnesium alloys (magnesium content): Czechia, 26%; Republic of Korea, 20%; Israel, 11%; Taiwan, 11%; and other, 32%. Sheet, powder, and other (magnesium content): Mexico, 30%; Austria, 23%; China,[5] 17%; Taiwan, 9%; and other, 21%. Scrap: Canada, 36%; Mexico, 15%; China, 14%; India, 8%; and other, 27%. Combined total (includes magnesium content of alloys, metal, powder, scrap, sheet, and other): Israel, 20%; Canada, 15%; Turkey, 11%; Czechia, 9%; and other, 45%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Unwrought metal	8104.11.0000	8% ad valorem.
Unwrought alloys	8104.19.0000	6.5% ad valorem.
Waste and scrap	8104.20.0000	Free.
Powders and granules	8104.30.0000	4.4% ad valorem.
Wrought metal	8104.90.0000	14.8¢/kg on magnesium content + 3.5% ad valorem.

Depletion Allowance: Dolomite, 14% (domestic and foreign); magnesium chloride (from brine wells), 5% (domestic and foreign).

Government Stockpile:[6]

	FY 2025		FY 2026	
Material	Potential acquisitions	Potential disposals	Potential acquisitions	Potential disposals
Magnesium (gross weight)	3.5	—	NA	NA

Events, Trends, and Issues: In September 2025, the operator of the only U.S. primary magnesium smelter located in Utah filed for Chapter 11 bankruptcy protection. Production decreased significantly in September 2021 after failures of critical equipment used in the production of magnesium, with only limited production which ceased in 2022. After primary production of magnesium stopped, production was limited to deicing products, dust suppressants, and sodium chloride from stockpiles.

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MAGNESIUM METAL

Magnesium prices in the United States decreased in April but remained stable through the end of 2025. Average U.S. import prices started the year at $3.25 per pound and decreased to $3.13 per pound the beginning of April and remained at that price through November. The price decrease was potentially attributable to sufficient inventory and decreased demand for primary magnesium, with secondary magnesium substituting part of that consumption. Based on domestic import data for the year through August, imports of magnesium metal (99.8% purity) decreased by 27% compared with those in the same period in 2024. Conversely, imports of magnesium alloys increased by 37% and imports of waste and scrap increased by 48% compared with those for the same period in 2024.

In 2025, magnesium prices in Europe gradually fluctuated throughout the year. Prices in Europe started the year with a range of $2,300 to $2,410 per ton, increased to a range of $2,550 to $2,650 per ton in the third quarter, and decreased to $2,450 to $2,550 at the end of November. The price fluctuations were attributed to closures related to ongoing maintenance and decreased producer inventories in China. The 2025 annual average price range for magnesium in Europe was estimated to be 13% less than that in 2024.

A company based in California continued the development of a pilot plant to produce magnesium metal from brines. In February 2024, the U.S. Department of War (DOW) awarded $19.6 million in financing to the company through the Defense Production Act, Title III, program. In July 2025, the company produced a sample of metal that was confirmed by the DOW to have met the purity target for the project on a pilot scale. In December, the company announced plans to construct a commercial phase 1 plant in southwestern Arkansas.

World Primary Production and Reserves: Production in 2024 for Russia was revised significantly based on a Government report. Smelter capacities for China and Kazakhstan were revised based on industry association reports.

	Smelter production[e]		Smelter capacity[e]
	2024	2025	2025
United States	—	—	[7]64
Brazil	20	20	22
China	[7]953	950	1,480
Iran	5	5	6
Israel	[7]17	20	[7]34
Kazakhstan	15	13	21
Russia	59	60	81
Turkey	15	15	[7]15
Other countries	—	—	42
World total (rounded)	1,080	1,100	1,800

World Resources:[8] Resources from which magnesium may be recovered range from large to virtually unlimited and are globally widespread. Resources of dolomite, serpentine, and magnesium-bearing evaporite minerals are enormous. Magnesium-bearing brines are estimated to constitute a resource in the billions of tons, and magnesium could be recovered from seawater along world coastlines.

Substitutes: Aluminum and zinc may substitute for magnesium in castings and wrought products. The relatively light weight of magnesium is an advantage over aluminum and zinc in castings and wrought products in most applications; however, its high cost is a disadvantage relative to these substitutes. For iron and steel desulfurization, calcium carbide may be used instead of magnesium. Magnesium is preferred to calcium carbide for desulfurization of iron and steel because calcium carbide produces acetylene in the presence of water.

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.
[1]See also the Magnesium Compounds chapter.
[2]Defined as primary production + secondary production from old scrap + imports – exports ± adjustments for industry stock changes.
[3]Source: S&P Global Platts Metals Week.
[4]Defined as imports – exports ± adjustments for industry stock changes.
[5]Includes Hong Kong.
[6]See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.
[7]Reported.
[8]See Appendix C for resource and reserve definitions and information concerning data sources.

MANGANESE

(Data in thousand metric tons, gross weight, unless otherwise specified)

Domestic Production and Use: Manganese ore containing 20% or more manganese has not been produced domestically since 1970. Manganese ore was consumed mainly by five companies: three companies produced manganese dioxide for pig iron manufacture, and two companies produced silicomanganese and ferromanganese. Other companies consumed ore for nonmetallurgical purposes, such as in the production of animal feed, brick colorant, dry cell batteries, and fertilizers.

Salient Statistics—United States:[1]	2021	2022	2023	2024	2025[e]
Production, mine	—	—	—	—	—
Imports for consumption:					
Manganese ores and concentrates	497	566	245	329	350
Ferromanganese	329	330	320	305	350
Silicomanganese	313	420	257	344	310
Exports:					
Manganese ores and concentrates	1	1	2	3	2
Ferromanganese	9	3	2	2	3
Silicomanganese	5	3	4	6	10
Shipments from Government stockpile:[2]					
Manganese ore	2	—	NA	NA	NA
Ferromanganese and manganese metal, electrolytic	21	14	NA	NA	NA
Consumption, reported:					
Manganese ore[3]	399	357	321	403	410
Ferromanganese	335	339	336	[e]330	350
Silicomanganese	237	234	230	[e]230	250
Consumption, apparent, manganese content[4]	717	804	653	[e]670	640
Price, average, manganese content, cost, insurance, and freight, China, dollars per metric ton unit[5]	5.27	5.97	4.80	5.53	4.50
Stocks, producer and consumer, yearend:					
Manganese ore[3]	220	312	233	188	200
Ferromanganese	40	50	27	[e]40	40
Silicomanganese	34	26	18	[e]30	30
Net import reliance[6] as a percentage of apparent consumption, manganese content	100	100	100	100	100

Recycling: Manganese was recycled incidentally as a constituent of ferrous and nonferrous scrap; however, scrap recovery specifically for manganese was negligible. Manganese is recovered along with iron from steel slag.

Import Sources (2021–24): Manganese ore: Gabon, 64%; South Africa, 24%; Mexico, 12%; and other, <1%. Ferromanganese: Malaysia, 26%; Australia, 16%; Norway, 16%; South Africa, 14%; and other, 28%. Silicomanganese: Georgia, 24%; South Africa, 23%; Australia, 18%; Malaysia, 13%; and other, 22%. Manganese contained in principal manganese imports:[7] Gabon, 23%; South Africa, 21%; Malaysia, 11%; Australia, 10%; and other, 35%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Ores and concentrates:		
Containing less than 47% manganese	2602.00.0040	Free.
Containing 47% or more of manganese	2602.00.0060	Free.
Manganese dioxide	2820.10.0000	4.7% ad valorem.
Ferromanganese, containing by weight:		
More than 2% but less than 4% carbon	7202.11.1000	1.4% ad valorem.
More than 4% carbon	7202.11.5000	1.5% ad valorem.
1% or less carbon	7202.19.1000	2.3% ad valorem.
More than 1% but less than 2% carbon	7202.19.5000	1.4% ad valorem.
Ferrosilicon manganese (silicomanganese)	7202.30.0000	3.9% ad valorem.
Metal, unwrought:		
Flake containing at least 99.5% manganese	8111.00.4700	14% ad valorem.
Other	8111.00.4900	14% ad valorem.

Depletion Allowance: 22% (domestic), 14% (foreign).

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MANGANESE

Government Stockpile:[8]

Material	FY 2025 Potential acquisitions	FY 2025 Potential disposals	FY 2026 Potential acquisitions	FY 2026 Potential disposals
Manganese ore, metallurgical grade	—	292	NA	NA
Ferromanganese, high carbon	—	18	NA	NA
Manganese metal, electrolytic	5	—	NA	NA

Events, Trends, and Issues: In 2025, global production of manganese ore, on a manganese-content basis, increased from that in 2024. The leading countries for manganese ore production were, in descending order on a manganese-content basis, South Africa, Gabon, Ghana, and Australia. Consumption of manganese closely follows the steel industry. The World Steel Association[9] estimated global finished steel consumption was unchanged in 2025 compared with that in 2024. On a manganese-content basis, total U.S. manganese imports were estimated to have decreased by 5% in 2025 compared with those in 2024. In October 2025, the year-to-date average spot market prices for manganese ore, 44% grade, from China had decreased by 22% compared with the annual average spot price in 2024. A manganese mine in northern Australia that suspended its operation in 2024 owing to a tropical cyclone resumed operation in May 2025.

World Mine Production (manganese content) and Reserves: Significant revisions were made to the 2024 production for Australia and Ghana based on company and Government reports. Reserves for Australia, Brazil, China, Malaysia, and South Africa were revised based on company and Government reports.

	Mine production 2024	Mine production 2025[e]	Reserves[10]
United States	—	—	—
Australia	[e]1,600	1,600	[11]580,000
Brazil	705	800	300,000
China	690	700	260,000
Côte d'Ivoire	340	350	NA
Gabon	4,640	5,000	61,000
Ghana	1,280	2,000	13,000
India	731	790	34,000
South Africa	7,490	7,600	550,000
Other countries	1,240	1,300	Small
World total (rounded)	18,700	20,000	1,800,000

World Resources:[10] Land-based manganese resources are large but irregularly distributed; those in the United States are very low grade and have potentially high extraction costs. South Africa accounts for an estimated 70% of the world's manganese resources.

Substitutes: Manganese has no satisfactory substitute in its major applications.

[e]Estimated. NA Not available. — Zero.

[1]Manganese content typically ranges from 35% to 54% for manganese ore and from 74% to 95% for ferromanganese.

[2]Defined as change in total inventory from prior yearend inventory. If negative, increase in inventory. Beginning in 2023, Government stock changes no longer available.

[3]Exclusive of ore consumed directly at iron and steel plants and associated yearend stocks.

[4]Defined for 2021–22 as imports – exports ± adjustments for Government and industry stock changes. Beginning in 2023, Government stock changes no longer included. Manganese content based on estimates of average content for all significant components—including ferromanganese, manganese dioxide, manganese ore, manganese waste and scrap, silicomanganese, unwrought manganese metal, and wrought manganese metal.

[5]For average metallurgical-grade ore containing 44% manganese. Source: CRU Group.

[6]Defined for 2021–22 as imports – exports ± adjustments for Government and industry stock changes. Beginning in 2023, Government stock changes no longer included.

[7]Includes imports of ferromanganese, manganese dioxide, manganese ore, silicomanganese, and unwrought manganese metal.

[8]See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.

[9]Source: World Steel Association, 2025, Short range outlook October 2025: Brussels, Belgium, World Steel Association press release, October 13, 3 p.

[10]See Appendix C for resource and reserve definitions and information concerning data sources.

[11]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 110 million tons.

MERCURY

(Data in metric tons, mercury content, unless otherwise specified)

Domestic Production and Use: Mercury has not been produced as a principal mineral commodity in the United States since 1992. In 2025, mercury was recovered as a byproduct from processing gold-silver ore at several mines in Nevada; however, production data were not reported. Secondary, or recycled, mercury was recovered from batteries, compact and traditional fluorescent lamps, dental amalgam, medical devices, and thermostats, as well as mercury-contaminated soils. The U.S. Environmental Protection Agency (EPA) reported in their 2023 triennial report that domestic production[1] of mercury in 2021 was 103 tons compared with 45 tons produced in 2018 as reported in the EPA's 2020 triennial report. About 182 tons of mercury was stored by manufacturers or producers in 2021 compared with 82 tons of mercury stored in 2018. The reported domestic consumption of mercury and mercury in compounds in products was 13 tons in 2021 compared with 16 tons in 2018. On November 21, 2024, the U.S. Department of Energy (DOE) awarded a company in Texas a 5-year contract to construct a long-term storage facility with a capacity of as much as 7,000 tons of elemental mercury.

The leading domestic end uses of mercury and mercury compounds were relays, sensors, switches, and valves, 65%; dental amalgam, 27%; formulated products (buffers, catalysts, fixatives, and vaccination uses), 7%; and bulbs, lamps, and lighting, 1%. A large quantity of elemental mercury (about 163 tons) is used domestically in manufacturing processes such as catalysts or as a cathode in the chlorine-caustic soda (chloralkali) process. Almost all the mercury is reused in the process. The leading manufacturing processes that use mercury are mercury-cell chloralkali plants. In 2025, only one mercury-cell chloralkali plant operated in the United States.

Until December 31, 2012, domestic- and foreign-sourced mercury was refined and then exported for global use, primarily for small-scale gold mining in many parts of the world. Beginning January 1, 2013, export of elemental mercury from the United States was banned, with some exceptions, under the Mercury Export Ban Act of 2008. Effective January 1, 2020, exports of five mercury compounds were added to that ban.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production[1]	103	NA	NA	NA	NA
Imports for consumption, metal (gross weight)	1	2	4	2	—
Exports, metal (gross weight)	—	—	—	—	—
Consumption, reported	13	NA	NA	NA	NA
Price, average unit value of imports, dollars per kilogram	29	33	22	50	NA
Net import reliance[2] as a percentage of apparent consumption	NA	NA	NA	NA	NA

Recycling: In 2025, eight facilities operated by six companies in the United States accounted for most of the secondary mercury produced and were authorized by the DOE to temporarily store mercury until the DOE's long-term facility opens. Mercury-containing automobile convenience switches, barometers, compact and traditional fluorescent bulbs, computers, dental amalgam, medical devices, and thermostats were collected by smaller companies and shipped to the refining companies for retorting to reclaim the mercury. In addition, many collection companies recovered mercury when retorting was not required. With the rapid replacement of compact and traditional fluorescent lighting by light-emitting-diode (LED) lighting, more mercury was being recycled.

Import Sources (2021–24): Canada, 69%; China,[3] 31%; and other, <1%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Mercury	2805.40.0000	1.7% ad valorem.
Amalgams	2843.90.0000	3.7% ad valorem.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile: None.

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MERCURY

Events, Trends, and Issues: Owing to mercury toxicity and concerns for the environment and human health, overall mercury use has declined in the United States and worldwide. According to the United Nations Environment Programme (UNEP) Global Mercury Assessment 2018 report, the top five leading sources of global anthropogenic mercury emissions by sector were artisanal and small-scale gold mining (838 tons), stationary combustion of coal (474 tons), nonferrous-metal production (327 tons), cement production (233 tons), and waste from products (147 tons). Mercury is no longer used in most batteries and paints manufactured in the United States. Some button-type batteries, cleansers, fireworks, folk medicines, grandfather clocks, pesticides, and skin-lightening creams and soaps may still contain mercury. Mercury compounds were used as catalysts in the coal-based manufacture of vinyl chloride monomer in China. In some parts of the world, mercury was used in the recovery of gold in artisanal and small-scale mining operations. Conversion to nonmercury technology for chloralkali production and the ultimate closure of the world's mercury-cell chloralkali plants may release a large quantity of mercury to the global market for recycling, sale, or, owing to export bans in Europe and the United States, long-term storage.

Byproduct mercury production is expected to continue from large-scale domestic and foreign gold-silver mining and processing. Domestic mercury consumption will continue to decline owing to increased use of LED lighting and consequent reduced use of conventional fluorescent tubes and compact fluorescent bulbs and continued substitution of non-mercury-containing products in control, dental, and measuring applications.

World Mine Production and Reserves:

	Mine production[e]		Reserves[4]
	2024	2025	
United States	NA	NA	Quantitative estimates of reserves were not available. China, Kyrgyzstan, and Peru have the largest reserves.
China	200	200	
Kyrgyzstan	5	5	
Morocco	2	2	
Norway	1	1	
Peru (exports)	NA	NA	
Tajikistan	4	4	
World total (rounded)[5]	212	210	

World Resources:[4] China, Kyrgyzstan, Mexico, Peru, Russia, Slovenia, Spain, and Ukraine have most of the world's estimated 600,000 tons of mercury resources. Mexico reclaims mercury from Spanish colonial silver-mining waste. In Spain, once a leading producer of mercury, mining at its centuries-old Almaden Mine stopped in 2003. In the United States, mercury occurrences are in Alaska, Arkansas, California, Nevada, and Texas. The declining consumption of mercury, except for small-scale gold mining, indicates that these resources are sufficient for centuries of use.

Substitutes: Ceramic composites substitute for the dark-gray mercury-containing dental amalgam. "Galinstan," an alloy of gallium, indium, and tin, replaces the mercury used in traditional mercury thermometers, and digital thermometers have replaced traditional thermometers. At chloralkali plants around the world, mercury-cell technology is being replaced by newer diaphragm and membrane-cell technology. LEDs that contain indium substitute for mercury-containing fluorescent lamps. Lithium, nickel-cadmium, and zinc-air batteries replace mercury-zinc batteries in the United States; indium compounds substitute for mercury in alkaline batteries; and organic compounds are being used instead of mercury fungicides in latex paint.

[e]Estimated. NA Not available. — Zero.
[1]Includes byproduct and secondary elemental mercury production and mercury compounds.
[2]Defined as imports – exports.
[3]Includes Hong Kong.
[4]See Appendix C for resource and reserve definitions and information concerning data sources.
[5]Excludes U.S. production.

MICA (NATURAL)

(Data in metric tons unless otherwise specified)

Domestic Production and Use: Scrap and flake mica production, excluding low-quality sericite, was estimated to be 26,000 tons valued at $3.8 million. Mica was mined in Georgia and North Carolina. Scrap mica was recovered principally from mica and sericite schist and as a byproduct from the production of feldspar and kaolin and the beneficiation of industrial sand. Eight companies produced an estimated 59,000 tons of ground mica valued at about $20 million from domestic and imported scrap and flake mica. Most of the domestic production was processed into small-particle-size mica by either wet or dry grinding. Primary uses were joint compound, oil-well-drilling additives, paint, roofing, and rubber products.

A minor amount of sheet mica has been produced as incidental production from feldspar mining in North Carolina in the past several years. Data on sheet mica production were not available in 2025. The domestic consuming industry was dependent on imports to meet demand for sheet mica. Most sheet mica was fabricated into parts for electrical and electronic equipment.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Scrap and flake:					
Production:[e, 1]					
Sold or used	41,000	42,000	37,000	24,000	26,000
Ground	67,000	66,000	66,000	51,000	59,000
Imports[2]	24,400	22,600	16,400	19,700	18,000
Exports[3]	4,850	4,450	3,740	4,160	4,700
Consumption, apparent[e, 4]	61,000	60,000	50,000	40,000	39,000
Price, average, dollars per metric ton:[e]					
Scrap and flake	100	100	100	140	130
Ground:					
Dry	300	300	310	330	320
Wet	340	350	350	350	350
Net import reliance[5] as a percentage of apparent consumption	32	30	25	39	34
Sheet:					
Sold or used	NA	NA	NA	NA	NA
Imports[6]	3,990	4,400	4,320	4,520	5,100
Exports[7]	633	803	1,010	870	900
Consumption, apparent[e, 4]	3,350	3,490	3,310	3,650	4,200
Price, average value, muscovite and phlogopite mica, dollars per kilogram:[e]					
Block	W	W	W	W	W
Splittings	1.90	1.60	1.80	1.80	1.80
Net import reliance[5] as a percentage of apparent consumption	100	100	100	100	100

Recycling: None.

Import Sources (2021–24): Scrap and flake: China, 42%; Canada, 35%; India, 7%; Finland, 5%; and other, 11%. Sheet: China, 73%; Vietnam, 8%; Brazil, 5%; India, 4%; and other, 10%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Split block mica	2525.10.0010	Free.
Mica splittings	2525.10.0020	Free.
Unworked, other	2525.10.0050	Free.
Mica powder	2525.20.0000	Free.
Mica waste	2525.30.0000	Free.
Plates, sheets, and strips of agglomerated or reconstituted mica	6814.10.0000	2.7% ad valorem.
Worked mica and articles of mica, other	6814.90.0000	2.6% ad valorem.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile: None.

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MICA (NATURAL)

Events, Trends, and Issues: Domestic production of scrap and flake mica was estimated to have increased by 8% in 2025. Estimated domestic apparent consumption of scrap and flake mica decreased by 3%. At the beginning of 2025, the number of drill rigs operating for the oil and gas industry in the United States was 582;[8] by the end of November 2025 the number of rigs operating had declined to 549,[8] likely indicating that less mica was consumed in well drilling.

Apparent consumption of sheet mica was estimated to have increased by 15% compared with that in 2024, as imports were 13% higher and exports were 3% higher than those in 2024. Supplies of sheet mica for United States consumption were expected to continue to be from imports, primarily from China and some from Brazil.

World Mine Production and Reserves: World production of sheet mica has remained steady; however, reliable production data for some countries that were estimated to be major contributors to the world total were unavailable.

	Scrap and flake			Sheet		
	Mine production[e]		Reserves[9]	Mine production[e]		Reserves[9]
	2024	2025		2024	2025	
United States	24,000	26,000	Large	NA	NA	Very small
Canada	14,000	14,000	Large	NA	NA	NA
China	85,000	85,000	1,100,000	NA	NA	75,000
Finland	[10]56,900	57,000	Large	NA	NA	NA
France	14,000	14,000	Large	NA	NA	NA
India	14,000	13,000	Large	1,000	1,000	110,000
Korea, Republic of	21,000	15,000	12,000,000	—	—	NA
Madagascar	90,000	70,000	Large	—	—	NA
Spain	8,000	8,000	Large	—	—	NA
Turkey	[10]9,640	9,500	620,000	—	—	NA
Other countries	44,000	39,000	Large	200	200	Moderate
World total (rounded)	376,000	350,000	Large	NA	NA	NA

World Resources:[9] Resources of scrap and flake mica are available in clay deposits, granite, pegmatite, and schist, and are considered more than adequate to meet anticipated world demand in the foreseeable future. World resources of sheet mica have not been formally evaluated because of the sporadic occurrence of this material. Large deposits of mica-bearing rock are known to exist in countries such as Brazil, India, and Madagascar. Limited resources of sheet mica are available in the United States. Domestic resources were subeconomic because of the high cost of the hand labor required to mine and process sheet mica from pegmatites.

Substitutes: Some lightweight aggregates, such as diatomite, perlite, and vermiculite, may be substituted for ground mica when used as filler. Ground synthetic fluorophlogopite, a fluorine-rich mica, may replace natural ground mica for uses that require the thermal and electrical properties of mica. Many materials can be substituted for mica in numerous electrical, electronic, and insulation uses. Substitutes include acrylic, cellulose acetate, fiberglass, fishpaper, nylatron, nylon, phenolics, polycarbonate, polyester, polyvinyl chloride, styrene, and vulcanized fiber. Mica paper made from scrap mica can be substituted for sheet mica in electrical and insulation applications.

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.
[1]Excludes low-quality sericite used primarily for brick manufacturing.
[2]Includes data for the following Harmonized Tariff Schedule of the United States codes: 2525.10.0050, <$6.00 per kilogram; 2525.20.0000; and 2525.30.0000.
[3]Includes data for the following Schedule B numbers: 2525.10.0000, <$6.00 per kilogram; 2525.20.0000; and 2525.30.0000.
[4]Defined as sold or used by producing companies + imports – exports.
[5]Defined as imports – exports.
[6]Includes data for the following Harmonized Tariff Schedule of the United States codes: 2525.10.0010; 2525.10.0020; 2525.10.0050, >$6.00 per kilogram; 6814.10.0000; and 6814.90.0000.
[7]Includes data for the following Schedule B numbers: 2525.10.0000, >$6.00 per kilogram; 6814.10.0000; and 6814.90.0000.
[8]Source: Baker Hughes Co., 2025, North America rotary rig count: Baker Hughes Co. (Accessed November 17, 2025, at https://bakerhughesrigcount.gcs-web.com/na-rig-count?c=79687&p=irol-reportsother).
[9]See Appendix C for resource and reserve definitions and information concerning data sources.
[10]Reported.

MOLYBDENUM

(Data in metric tons, molybdenum content, unless otherwise specified)

Domestic Production and Use: Total estimated U.S. mine production of molybdenum concentrate increased by 18% to 40,000 tons of molybdenum content in 2025 compared with 34,000 tons in 2024. Molybdenum concentrate production at primary molybdenum mines continued at two operations in Colorado, and molybdenum concentrate production from mines where molybdenum was a byproduct continued at seven operations (four in Arizona and one each in Montana, Nevada, and Utah). Three roasting plants converted molybdenum concentrate to molybdic oxide, from which intermediate products, such as ferromolybdenum, metal powder, and various chemicals, were produced. Molybdenum is a refractory metallic element used principally as an alloying agent in cast iron, steel, and superalloys and is also used in numerous chemical applications, including catalysts, lubricants, and pigments.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production, mine	41,100	34,600	34,000	34,000	40,000
Imports for consumption total:					
Ore and concentrates	15,500	15,700	16,200	14,700	17,000
Primary products	14,700	13,100	13,500	12,200	9,700
Exports:					
Ore and concentrates[1]	33,900	26,900	29,200	26,900	27,000
Primary products	4,150	4,860	4,230	5,890	6,500
Consumption:					
Reported[2]	16,100	15,800	[e]16,000	[e]17,000	18,000
Apparent[3]	33,100	31,500	30,700	28,500	34,000
Price, average, dollars per kilogram[4]	35.62	41.72	54.32	47.72	51
Stocks, consumer materials	2,040	2,040	[e]1,900	[e]1,900	2,000
Net import reliance[5] as a percentage of apparent consumption	E	E	E	E	E

Recycling: Molybdenum is recycled as a component of catalysts, ferrous scrap, and superalloy scrap. Revert scrap comes from steelmaking remnants, new scrap is generated by steel mill customers and recycled by processors, and old scrap consists of molybdenum-bearing alloys recycled after their service life. The amount of molybdenum recycled as part of new and old steel and other scrap may be as much as 30% of the apparent supply of molybdenum. There are no separate recovery processes for the refining of secondary molybdenum from its alloys, but the molybdenum content of the recycled alloys is significant and reused.

Import Sources (2021–24): Ferromolybdenum: Chile, 74%; Republic of Korea, 21%; United Kingdom, 4%; and other, 1%. Molybdenum ore and concentrates: Peru, 69%; Mexico, 15%; Chile, 12%; and Canada, 4%.
Total: Chile, 36%; Peru, 35%; Mexico, 8%; Republic of Korea, 7%; and other, 14%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Molybdenum ore and concentrates, roasted	2613.10.0000	12.8¢/kg on molybdenum content + 1.8% ad valorem.
Molybdenum ore and concentrates, other	2613.90.0000	17.8¢/kg on molybdenum content.
Molybdenum chemicals:		
Molybdenum oxides and hydroxides	2825.70.0000	3.2% ad valorem.
Molybdates of ammonium	2841.70.1000	4.3% ad valorem.
Molybdates, all others	2841.70.5000	3.7% ad valorem.
Molybdenum pigments, molybdenum orange	3206.20.0020	3.7% ad valorem.
Ferroalloys, ferromolybdenum	7202.70.0000	4.5% ad valorem.
Molybdenum metals:		
Powders	8102.10.0000	9.1¢/kg on molybdenum content + 1.2% ad valorem.
Unwrought	8102.94.0000	13.9¢/kg on molybdenum content + 1.9% ad valorem.
Wrought bars and rods	8102.95.3000	6.6% ad valorem.
Wrought plates, sheets, strips, and so forth	8102.95.6000	6.6% ad valorem.
Wire	8102.96.0000	4.4% ad valorem.
Waste and scrap	8102.97.0000	Free.
Other	8102.99.0000	3.7% ad valorem.

Depletion Allowance: 22% (domestic), 14% (foreign).

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MOLYBDENUM

Government Stockpile: None.

Events, Trends, and Issues: In 2025, the estimated average U.S. molybdic oxide price increased by 7% compared with that in 2024. Estimated U.S. total imports for consumption of molybdenum were 27,000 tons compared with 26,900 tons in 2024. Estimated U.S. total exports increased by 1% compared with those in 2024. Estimated apparent consumption in 2025 increased by 18% compared with that in 2024. Estimated global molybdenum production in 2025 increased by 2% from that in 2024, with China, Chile, the United States, Peru, and Mexico, in descending order of production, accounting for 90% of total global production. Only China and the United States produced molybdenum from both primary molybdenum mines and byproduct copper mines; the other countries relied on byproduct copper production. Rising molybdenum consumption has led many copper producers to upgrade facilities to extract molybdenite from existing deposits, helping offset supply risks from aging mines and declining ore grades. Global molybdenum consumption was expected to remain strong as countries continued to invest in renewable energy infrastructure. A Canadian company remained on schedule to restart its idled molybdenum mine in Idaho during the second half of 2027 and continued its progressive rampup to full capacity production at its molybdenum-processing facility in Pennsylvania. The Government of China imposed export controls on molybdenum powders in February 2025, prompting the United States and other countries to seek alternative sources.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Australia and Canada based on company and Government reports. Reserves data for Australia, Chile, China, North Korea, and Peru were revised based on company and Government reports.

	Mine production		Reserves[6]
	2024	2025[e]	(thousand metric tons)
United States	34,000	40,000	3,500
Armenia	[e]8,200	5,300	150
Australia	600	1,000	[7]760
Canada	1,540	2,200	64
Chile	38,500	42,000	2,600
China	[e]100,000	97,000	7,800
Iran	[e]2,900	3,300	43
Kazakhstan	4,080	4,300	7
Korea, North	[e]800	800	78
Korea, Republic of	340	500	8
Mexico	16,200	17,000	130
Mongolia	3,110	4,200	10
Peru	41,900	39,000	1,000
Russia	[e]1,500	1,300	1,100
Uzbekistan	[e]2,100	2,000	21
Other countries	—	—	150
World total (rounded)	256,000	260,000	17,000

World Resources:[6] Identified resources of molybdenum in the United States are about 5.4 million tons and, in the rest of the world, about 20 million tons. Molybdenum occurs as the principal metal sulfide in large low-grade porphyry molybdenum deposits and as an associated metal sulfide in low-grade porphyry copper deposits. Resources of molybdenum are adequate to supply world needs for the foreseeable future.

Substitutes: There is little substitution for molybdenum in its major application in steels and cast irons. In fact, because of the availability and versatility of molybdenum, industry has sought to develop new materials that benefit from its alloying properties. Potential substitutes include boron, chromium, niobium (columbium), and vanadium in alloy steels; tungsten in tool steels; graphite, tantalum, and tungsten for refractory materials in high-temperature electric furnaces; and cadmium-red, chrome-orange, and organic-orange pigments for molybdenum orange.

[e]Estimated. E Net exporter. — Zero.

[1]Molybdenum content of exports of molybdenum ores and concentrates was estimated based on U.S. Census Bureau unit values.

[2]Reported consumption of primary products.

[3]Defined as production + imports – exports ± adjustments for all industry stock changes.

[4]U.S. molybdic oxide (MoO_3) price, 57% molybdenum content. Source: Argus Media group, Argus Non-Ferrous Markets.

[5]Defined as imports – exports ± adjustments for industry stock changes.

[6]See Appendix C for resource and reserve definitions and information concerning data sources.

[7]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 260,000 tons.

NICKEL

(Data in metric tons, nickel content, unless otherwise specified)

Domestic Production and Use: In 2025, the underground Eagle Mine in Michigan produced approximately 10,000 tons of nickel in concentrate, which was exported to smelters in Canada and overseas. In the United States, the leading uses for primary nickel were alloys and steels, electroplating, and other uses including catalysts and chemicals. Stainless and alloy steel and nickel-containing alloys typically account for more than 85% of domestic consumption.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production:					
Mine	18,400	17,500	16,400	7,490	10,000
Refinery, byproduct	W	W	W	W	W
Imports:					
Ores and concentrates	18	([1])	4	12	20
Primary	108,000	127,000	112,000	105,000	100,000
Secondary	34,400	37,300	39,600	40,000	45,000
Exports:					
Ores and concentrates	14,900	15,200	9,100	5,630	11,000
Primary	11,600	11,100	12,200	15,900	9,800
Secondary	29,200	44,400	57,200	46,900	35,200
Consumption:					
Reported, primary	92,100	96,700	107,000	114,000	120,000
Reported, secondary, purchased scrap[2]	156,000	153,000	140,000	121,000	130,000
Apparent, primary[3]	97,500	117,000	98,500	90,300	90,000
Apparent, total[4]	254,000	270,000	238,000	211,000	220,000
Price, average annual, London Metal Exchange (LME), cash:					
Dollars per metric ton	18,476	25,815	21,495	16,812	15,000
Dollars per pound	8.38	11.71	9.75	7.63	6.90
Stocks, yearend:					
Consumer	25,100	23,200	25,700	25,500	25,000
LME U.S. warehouses	1,296	6	1,506	258	110
Net import reliance[5, 6] as a percentage of total apparent consumption[e]	38	43	41	43	41

Recycling: Most secondary nickel was in the form of nickel content of stainless-steel scrap. Nickel in alloyed form was recovered from the processing of nickel-containing waste. Most recycled nickel was used to produce new alloys and stainless steel. In 2025, nickel recovered from scrap accounted for approximately 60% of apparent consumption.

Import Sources (2021–24): Primary nickel: Canada, 44%; Norway, 11%; Australia, 8%; Brazil, 7%; and other, 30%. Nickel-containing scrap, including nickel content of stainless-steel scrap: Canada, 41%; Mexico, 27%; United Kingdom, 9%, and other, 23%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Nickel ores and concentrates, nickel content	2604.00.0040	Free.
Ferronickel	7202.60.0000	Free.
Unwrought nickel, not alloyed	7502.10.0000	Free.
Nickel waste and scrap	7503.00.0000	Free.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile: The U.S. Department of Energy is holding approximately 9,700 tons of radiologically contaminated nickel at Paducah, KY.

Events, Trends, and Issues: Prices continued their downward trend from 2022 highs. In 2025, the annual average LME nickel cash price was estimated to have decreased by 11% compared with that in 2024. According to the International Nickel Study Group, the global primary nickel market balance (the difference between production and consumption) has been in a state of surplus since 2022. The surplus was estimated to be 98,500 tons in 2022, 170,000 tons in 2023, and 182,000 tons in 2024. Through the first 9 months of 2025, the estimated surplus was 189,000 tons, compared with 107,000 tons during the same period in 2024.

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NICKEL

Nickel-bearing mine projects were under consideration or development in Alaska, Michigan, Minnesota, Nevada, and Oregon. In Minnesota, a company continued to progress a feasibility study for the Tamarack nickel-copper-cobalt project. In 2025, the Nikolai and NorthMet projects, located in Alaska and Minnesota, respectively, were designated as Federal Transparency Projects under the Fixing America's Surface Transport Act and added to the permitting dashboard. Three companies were considering or developing nickel refinery projects in Missouri, Oklahoma, and Texas. In Oklahoma, a company built a pilot-scale nickel refining facility. The last U.S. primary nickel refinery, the Port Nickel facility in Louisiana, ceased operations in 1985. Small amounts of nickel continued to be recovered domestically as a byproduct of copper and platinum-group-metals processing and from recycled materials.

Executive Order 14285, issued in April, called for the development of seabed mineral deposits to help secure supplies of critical minerals such as nickel. Following the order, several companies submitted applications to explore regions prospective for nickel-bearing ferromanganese crusts and polymetallic nodules. A 2022 U.S. Geological Survey study estimated that global seabed deposits contain approximately 4.5 billion tons of nickel.[7]

Estimated global nickel mine production increased by 5% to an estimated 3.9 million tons in 2025. Production in Indonesia increased by an estimated 13% as new operations continued to ramp up production. Canadian production increased after a company completed a mine expansion. In New Caledonia, production increased as a result of more consistent operating conditions after the interruptions in 2024. Production in Australia decreased by an estimated 54% after multiple companies placed mines into care-and-maintenance status owing to low prices. In the Philippines, production declined by an estimated 24% after multiple mines reported production cuts. In the Philippine Province of Palawan, a 50-year ban on new mining permits was announced. The ban did not affect existing operations.

World Mine Production and Reserves: Production in 2024 for Canada was revised significantly based on a Government report. Reserves for Australia, Indonesia, and the United States were revised based on company and Government reports.

	Mine production		Reserves[8]
	2024	2025[e]	
United States	7,490	10,000	340,000
Australia	98,000	45,000	[9]25,000,000
Brazil	67,500	70,000	16,000,000
Canada	125,000	140,000	2,200,000
China	[e]115,000	120,000	4,400,000
Indonesia	2,310,000	2,600,000	62,000,000
New Caledonia[10]	116,000	140,000	7,100,000
Philippines	354,000	270,000	4,800,000
Russia	205,000	200,000	8,300,000
Other countries	308,000	290,000	>9,100,000
World total (rounded)	3,710,000	3,900,000	>140,000,000

World Resources:[8] Globally, nickel resources have been estimated to contain more than 350 million tons of nickel, with 54% in laterites and 35% in magmatic sulfide deposits. Hydrothermal systems such as iron-nickel alloy, sedimentary-hosted polymetallic, and volcanogenic massive sulfide deposits, as well as seafloor manganese crusts and nodules contain 10%, and miscellaneous resources such as tailings, 1%.

Substitutes: Low-nickel, duplex, or ultrahigh-chromium stainless steels have been substituted for austenitic grades in construction. Nickel-free specialty steels are sometimes used in place of stainless steel in the power-generating and petrochemical industries. Titanium alloys can substitute for nickel or nickel-base alloys in corrosive environments.

[e]Estimated. W Withheld to avoid disclosing company proprietary data.
[1]Less than ½ unit.
[2]Significant revisions were made to secondary scrap estimates following review of updated data.
[3]Defined as primary imports – primary exports ± adjustments for industry stock changes, excluding secondary consumer stocks.
[4]Defined as apparent primary consumption + reported secondary consumption.
[5]Defined as imports – exports ± adjustments for consumer stock changes.
[6]Includes the nickel content of stainless steel and alloy scrap. Excluding scrap, net import reliance would be nearly 100%.
[7]Mizell, K., Hein, J.R., Au, M., Gartman, A., 2022, Manganese nodules and ferromanganese crusts in the global ocean based on regional variations and genetic types of nodules, chap. 3 *of* Sharma, Rahul, Perspectives on deep-sea mining: Cham, Switzerland, Springer, p. 53–80.
[8]See Appendix C for resource and reserve definitions and information concerning data sources.
[9]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 11 million tons.
[10]Overseas territory of France.

NIOBIUM (COLUMBIUM)

(Data in metric tons, niobium content, unless otherwise specified)

Domestic Production and Use: Significant U.S. niobium mine production has not been reported since 1959. Companies in the United States produced niobium-containing materials from imported niobium concentrates, oxides, and ferroniobium. Niobium was consumed mostly in the form of ferroniobium by the steel industry and as niobium alloys and metal by the aerospace industry. Major end-use distribution of domestic niobium consumption was estimated as follows: steels, about 77%, and superalloys, about 23%. The estimated value of niobium imports was $525 million.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production, mine	—	—	—	—	—
Imports for consumption[1]	8,230	9,110	10,100	9,820	10,000
Exports[1]	992	667	951	485	420
Shipments from Government stockpile[2]	−1	—	NA	NA	NA
Consumption:[e]					
Apparent[3]	7,240	8,440	9,100	9,340	9,900
Reported[4]	6,110	7,230	7,110	6,600	6,700
Price, average unit value, ferroniobium, dollars per kilogram[5]	21	25	25	26	26
Net import reliance[3] as a percentage of apparent consumption	100	100	100	100	100

Recycling: Niobium was recycled when niobium-bearing steels and superalloys were recycled; scrap recovery, specifically for niobium content, was negligible. The amount of niobium recycled was not available, but it may have been as much as 20% of apparent consumption.

Import Sources (2021–24): Niobium and tantalum ores and concentrates: Australia, 62%; Congo (Kinshasa), 9%; Mozambique, 9%; United Arab Emirates, 5%; and other, 15%. Niobium oxide: Brazil, 89%; Estonia, 4%; Thailand, 4%; and other, 3%. Ferroniobium and niobium metal: Brazil, 65%; Canada, 31%; and other, 4%. Total imports: Brazil, 67%; Canada, 28%; and other, 5%. Of U.S. niobium material imports (by niobium content), 68% was ferroniobium, 22% was niobium metal, 9% was niobium oxide, and 1% was niobium ores and concentrates.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Synthetic tantalum-niobium concentrates	2615.90.3000	Free.
Niobium ores and concentrates	2615.90.6030	Free.
Niobium oxide	2825.90.1500	3.7% ad valorem.
Ferroniobium:		
Less than 0.02% phosphorus or sulfur, or less than 0.4% silicon	7202.93.4000	5% ad valorem.
Other	7202.93.8000	5% ad valorem.
Niobium:		
Waste and scrap[6]	8112.92.0700	Free.
Powders and unwrought metal	8112.92.4000	4.9% ad valorem.
Other[6]	8112.99.9100	4% ad valorem.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile:[7]

	FY 2025		FY 2026	
Material	Potential acquisitions	Potential disposals	Potential acquisitions	Potential disposals
Ferroniobium	136	—	NA	NA

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NIOBIUM (COLUMBIUM)

Events, Trends, and Issues: In 2025, U.S. niobium apparent consumption (measured in niobium content) was estimated to be 9,900 tons, a 6% decrease from that in 2024. One domestic company developing its niobium, scandium, and titanium project in Nebraska continued to secure financing in 2025. In August, the U.S. Department of War awarded $10 million to the company to support the establishment of a vertically integrated domestic supply chain for scandium alloy production. Although the award was directed toward scandium alloy supply chain development, advancements to the project were also expected to support development of the company's niobium and titanium operations. Once operational, the site would be the only niobium mine and primary niobium-processing facility in the United States.

Brazil continued to be the world's leading niobium producer, accounting for approximately 93% of global production, followed by Canada with 5%. According to international trade statistics under the Harmonized System code 7202.93 (ferroniobium), Brazil's total exports in 2024 were 92,000 tons and were 63,200 tons from January through August 2025. Most of Brazil's exports went to China (49%), followed by the Netherlands (17%), Singapore (9%), and the Republic of Korea and the United States (8% each).

World Mine Production and Reserves: Reserves for Brazil, Canada, and Russia were revised based on company and Government reports.

	Mine production		Reserves[8]
	2024	2025[e]	
United States	—	—	210,000
Brazil	104,000	104,000	14,000,000
Canada	[e]6,900	6,000	640,000
China	[e]44	40	6,500,000
Congo (Kinshasa)	[e]930	970	NA
Russia	300	300	3,000
Rwanda	[e]210	200	NA
Other countries	[e]160	120	NA
World total (rounded)	112,000	112,000	>21,000,000

World Resources:[8] World resources of niobium are more than adequate to supply projected needs. Most of the world's identified resources of niobium occur as pyrochlore in carbonatite (igneous rocks that contain more than 50%-by-volume carbonate minerals) deposits and are outside the United States.

Substitutes: The following materials can be substituted for niobium, but a performance loss or higher cost may ensue: ceramic matrix composites, molybdenum, tantalum, and tungsten in high-temperature (superalloy) applications; molybdenum, tantalum, and titanium as alloying elements in stainless and high-strength steels; and molybdenum and vanadium as alloying elements in high-strength low-alloy steels.

[e]Estimated. NA Not available. — Zero.

[1]Imports and exports include the estimated niobium content of ferroniobium, niobium and tantalum ores and concentrates, niobium oxide, and niobium powders and unwrought metal. Niobium content was estimated assuming the following: 28% niobium oxide (Nb_2O_5) content in niobium ores and concentrates; 10% Nb_2O_5 content in tantalum ores and concentrates and synthetic concentrates; 100% niobium content in unwrought niobium metal (powders and other); and 65% niobium content in ferroniobium. Nb_2O_5 is 69.904% niobium by weight.

[2]Defined for 2021–22 as change in total inventory from prior yearend inventory. If negative, increase in inventory. Beginning in 2023, Government stock changes no longer included.

[3]Defined for 2021–22 as production + imports − exports ± adjustments for Government and industry stock changes. Beginning in 2023, Government stock changes no longer included.

[4]Only includes ferroniobium and nickel niobium.

[5]Unit value is weighted average unit value of gross weight of U.S. ferroniobium trade (imports plus exports).

[6]This category includes niobium-containing material and other material.

[7]See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.

[8]See Appendix C for resource and reserve definitions and information concerning data sources.

NITROGEN (FIXED)—AMMONIA

(Data in thousand metric tons, nitrogen content, unless otherwise specified)

Domestic Production and Use: Ammonia was produced by 18 companies at 38 plants in 19 States in the United States during 2025; 1 plant was idle for the entire year. About 57% of total U.S. ammonia production capacity was in Louisiana, Oklahoma, and Texas because of their large reserves of natural gas, the dominant domestic feedstock for ammonia. In 2025, the U.S. plants actively producing ammonia operated at about 80% of rated capacity. The United States was one of the world's leading producers and consumers of ammonia. Urea, ammonium nitrate, nitric acid, ammonium phosphates, and ammonium sulfate were, in descending order of quantity produced, the major derivatives of ammonia produced in the United States.

Approximately 88% of domestic ammonia production was for fertilizer use, including anhydrous ammonia for direct application, urea, ammonium nitrates, ammonium phosphates, and other nitrogen compounds. Ammonia also was used to produce explosives, plastics, synthetic fibers and resins, and numerous other chemical compounds.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production[1]	12,700	13,800	13,800	13,600	14,000
Imports for consumption	2,080	1,930	1,720	1,700	1,900
Exports	231	719	890	858	1,100
Consumption, apparent[2]	14,600	14,800	14,700	14,400	15,000
Stocks, producer, yearend	270	440	350	387	440
Price, average, free on board Gulf Coast,[3] dollars per short ton	578	1,070	470	440	450
Employment, plant, number[e]	1,600	1,600	1,600	1,600	1,600
Net import reliance[4] as a percentage of apparent consumption	13	7	6	6	5

Recycling: None.

Import Sources (2021–24): Canada, 49%; Trinidad and Tobago, 47%; and other, 4%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Ammonia, anhydrous	2814.10.0000	Free.
Urea	3102.10.0010	Free.
Ammonium sulfate	3102.21.0000	Free.
Ammonium nitrate	3102.30.0000	Free.

Depletion Allowance: Not applicable.

Government Stockpile: None.

Events, Trends, and Issues: The Henry Hub spot natural gas price ranged between $2.42 and $10.07 per million British thermal units for most of the year, with an average of about $3.44 per million British thermal units. Natural gas prices in 2025 were higher than those in 2024 owing to global trade disruptions, strong domestic demand due to tight crop planting windows, and changes in trade policy. The Energy Information Administration, U.S. Department of Energy, projected that Henry Hub natural gas spot prices would average around $3.56 per million British thermal units in 2025 and $4.01 per million British thermal units in 2026.

The weekly average Gulf Coast ammonia price was $490 per short ton at the beginning of 2025, decreased to $357 per short ton in late June, and increased to $492 per short ton in late September. The average ammonia price for 2025 was estimated to be $450 per short ton.

Large corn plantings maintain the continued demand for nitrogen fertilizers in the United States. According to the U.S. Department of Agriculture, U.S. corn growers planted 38.5 million hectares of corn in crop-year 2025 (July 1, 2024, through June 30, 2025), which was 5% more than the area planted in crop-year 2024. Corn acreage in crop-year 2026 was expected to decrease slightly because of anticipated lower returns for corn compared with those of other crops and owing to crop rotation.

Global ammonia production capacity was expected to increase, and new facilities were being developed in regions with access to low-cost natural gas such as Asia, Eastern Europe, and North America. In North America especially, there have been proposals for several decarbonized ammonia plants using technologies like carbon capture and green hydrogen. Ammonia consumption for fertilizer increased in Latin America and eastern Asia, driven by expanding agricultural activity and increasing food demand.

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NITROGEN (FIXED)—AMMONIA

In October 2025, a company initiated a controlled shutdown of its nitrogen facility at the Point Lisas Industrial Estate in Trinidad and Tobago. The closure was primarily driven by restricted port access imposed by Trinidad and Tobago's National Energy Corporation, which hindered operational logistics, and a prolonged period of natural gas supply issues. The plant had been producing approximately 85,000 tons of ammonia and 55,000 tons of urea per month. Despite the shutdown, the company was expected to meet its 2025 nitrogen sales target of 10.7 million to 11.2 million tons by leveraging strong performance from its North American operations. Future options for operations in Trinidad and Tobago were still being evaluated by the company.

World Ammonia Production and Reserves: Significant revisions were made to the 2024 production for Egypt and Germany based on company, Government, and industry reports.

	Plant production		Reserves[5]
	2024	2025[e]	
United States	13,600	14,000	Available atmospheric nitrogen and sources of natural gas for production of ammonia were considered adequate for all listed countries.
Algeria	2,000	2,000	
Australia	1,500	1,500	
Canada	3,800	3,800	
China	49,000	49,000	
Egypt	3,900	4,000	
Germany	2,220	2,000	
India	15,000	15,000	
Indonesia	5,700	6,000	
Iran	4,800	4,800	
Malaysia	1,500	1,500	
Netherlands	2,100	2,000	
Nigeria	2,000	2,000	
Oman	2,000	2,000	
Pakistan	3,800	3,800	
Poland	1,700	1,700	
Qatar	3,040	3,000	
Russia	15,000	15,000	
Saudi Arabia	5,200	5,200	
Trinidad and Tobago	3,350	3,300	
Uzbekistan	1,200	1,300	
Vietnam	1,440	1,400	
Other countries	12,200	12,000	
World total (rounded)	156,000	160,000	

World Resources:[5] The availability of nitrogen from the atmosphere for fixed nitrogen production is unlimited. Mineralized occurrences of sodium and potassium nitrates, such as those found in the Atacama Desert of Chile, contribute minimally to the global nitrogen supply.

Substitutes: Nitrogen is an essential plant nutrient that has no substitute. No practical substitutes for nitrogen explosives and blasting agents are known.

[e]Estimated.
[1]Source: The Fertilizer Institute; data adjusted by the U.S. Geological Survey.
[2]Defined as production + imports – exports ± adjustments for industry stock changes.
[3]Source: Green Markets.
[4]Defined as imports – exports ± adjustments for industry stock changes.
[5]See Appendix C for resource and reserve definitions and information concerning data sources.

PEAT

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: The estimated free on board (f.o.b.) mine value of marketable peat sold by producers in the United States was $11 million in 2025. Peat was harvested and processed by 26 companies in 11 States. Three companies were idle in 2025. The top three producing States were Florida, Maine, and Michigan, which accounted for 84% of the quantity of peat sold. Reed-sedge peat accounted for approximately 94% of the total volume produced, followed by sphagnum moss with an estimated 5%. Domestic peat applications included earthworm culture medium, golf course construction, mixed fertilizers, mushroom culture, nurseries, packing for flowers and plants, seed inoculants, and vegetable cultivation. In the industrial sector, peat was used as an oil absorbent and as an efficient filtration medium for the removal of waterborne contaminants in mine waste streams, municipal storm drainage, and septic systems.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production	324	343	329	[e]330	330
Sales by producers	386	497	498	[e]470	480
Imports for consumption	1,630	1,440	1,170	1,280	1,300
Exports	37	43	43	38	26
Consumption, apparent[1]	1,970	1,740	1,490	[e]1,550	1,700
Price, average unit value, f.o.b. mine, dollars per metric ton	38.52	26.58	23.02	[e]25	23
Stocks, producer, yearend	235	235	199	[e]220	160
Employment, mine and plant, number[e]	510	510	500	500	500
Net import reliance[2] as a percentage of apparent consumption	84	80	78	79	80

Recycling: None.

Import Sources (2021–24): Canada, 95%; and other, 5%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Peat	2703.00.0000	Free.

Depletion Allowance: 5% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Peat is an important component of plant-growing media, and the demand for peat generally follows that of horticultural applications. Imports in 2025 were estimated to be 1.3 million tons compared with 1.28 million tons in 2024, and exports were estimated to have decreased by 31% to an estimated 26,000 tons from 38,000 tons in 2024. In 2025, peat stocks were estimated to have decreased to 160,000 tons from 220,000 tons in 2024. The world's leading peat producers in 2025 were estimated to be, in descending order of production, Finland, Canada, Latvia, Belarus, Russia, and Sweden.

In 2025, Belarus opened a new peat briquet processing plant in the Krupki district of the Minsk region. The capacity was 32,500 tons per year but could be increased to 90,000 tons per year with additional production shifts. It was expected that the plant will export peat to China, Kazakhstan, Russia, and Turkey, as well as supply domestic needs. Contracts to supply peat to Chinese partners were signed in March 2025. The plant also was expected to begin shipping to Uzbekistan in 2026 under a distribution agreement.

Concerns about climate change prompted several countries to plan to decrease or eliminate the use of peat owing to peatland's ability to act as a carbon sink. Finland continued to work toward its goal of becoming carbon neutral by 2035. In December 2025, the Government of Finland approved two major climate policy plans—a medium-term climate plan and an energy and climate strategy—to help meet national and European Union climate targets. These include incentives for electric vehicles, carbon capture, and clean energy investments. According to Finland's Ministry of the Environment's 2025 Annual Climate Report, emissions from energy production fell sharply, coal use nearly halved, and peat use dropped by more than one-third.

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PEAT

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Canada, Finland, Germany, and Russia based on company, Government, and industry reports. Reserves for countries that reported by volume only and had insufficient data for conversion to tonnage were combined and included with "Other countries."

	Mine production		Reserves[3]
	2024	2025[e]	
United States	[e]330	330	150,000
Belarus	[e]1,900	1,800	2,600,000
Canada	1,760	2,000	720,000
Estonia	1,260	1,100	570,000
Finland	2,590	2,500	6,000,000
Germany	990	830	([4])
Latvia	2,700	2,000	150,000
Lithuania	457	540	210,000
Poland	886	890	([4])
Russia	[e]2,000	1,800	1,000,000
Sweden	1,890	1,800	([4])
Ukraine	[e]450	450	([4])
Other countries[e]	790	960	1,400,000
World total (rounded)	18,000	17,000	13,000,000

World Resources:[3] Peat is a renewable resource, continuing to accumulate on 60% of global peatlands. However, the volume of global peatlands has been decreasing at a rate of 0.05% per year owing to harvesting and land development. Many countries evaluate peat resources based on volume or area because the variations in densities and thickness of peat deposits make it difficult to estimate tonnage. Volume data have been converted using the average bulk density of peat produced in each of those countries. More than 50% of the U.S. peat resources are located in undisturbed areas of Alaska.

Substitutes: Natural organic materials, such as composted yard waste and coir (coconut fiber), compete with peat in horticultural applications. Shredded paper and straw are used to hold moisture for some grass-seeding applications. The superior water-holding capacity and physiochemical properties of peat limit substitution alternatives in most applications.

[e]Estimated.

[1]Defined as production + imports – exports ± adjustments for industry stock changes.

[2]Defined as imports – exports ± adjustments for industry stock changes.

[3]See Appendix C for resource and reserve definitions and information concerning data sources.

[4]Included with "Other countries."

PERLITE

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: In 2025, the quantity of domestic processed crude perlite sold and used was estimated to be 460,000 tons with a value of $36 million. Crude ore production was from nine mining operations managed by six companies across six Western States, with New Mexico maintaining its position as the leading producing State. Domestic apparent consumption of crude perlite was estimated to be 590,000 tons. Processed crude perlite was expanded at 53 plants in 29 States. The applications for expanded perlite were building construction products, 45%; horticultural aggregate, 15%; filter aids, 15%; and other, 25%. Other applications included fillers, which had been a leading end use in prior years but is withheld to avoid disclosing company proprietary data, as well as specialty insulation and miscellaneous uses.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Mine production, crude ore	879	672	654	716	730
Sold or used, processed crude perlite[1]	491	442	410	452	460
Imports for consumption[2]	170	240	140	220	160
Exports[2]	27	22	18	26	26
Consumption, apparent[3]	630	660	530	650	590
Price, average value, free on board mine, dollars per metric ton	64	69	74	75	78
Employment, mine and mill, number	150	150	150	150	150
Net import reliance[4] as a percentage of apparent consumption	23	33	23	30	23

Recycling: Not available.

Import Sources (2021–24): Greece, 94%; China, 3%; and other, 3%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Vermiculite, perlite, and chlorites, unexpanded	2530.10.0000	Free.

Depletion Allowance: 10% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Perlite is a siliceous volcanic glass that expands up to 20 times its original volume when rapidly heated. Construction applications for expanded perlite are numerous because it is fire resistant, an excellent insulator, and lightweight. In horticultural uses, expanded perlite is used to provide moisture retention and aeration without compaction when added to soil. Horticultural perlite is useful to both commercial growers and hobby gardeners.

In January 2025, a leading global producer of industrial minerals headquartered in France completed the acquisition of a European diatomite and perlite business that was previously owned by a Pittsburgh, PA-based corporation. The acquisition consisted of three mining and industrial assets in France and Italy.

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PERLITE

The amount of processed perlite sold or used from U.S. mines was estimated to have slightly increased in 2025 compared with the amount in 2024. Construction-related uses have consistently been the leading use of perlite. In the United States, new residential construction starts increased slightly during the first 8 months of 2025 compared with those in the same period in 2024.

The four leading perlite-producing countries, which accounted for 92% of world production in 2025, in descending order of estimated production, were China, Turkey, Greece, and the United States. Although China was the leading producer, most of its perlite production was estimated to be consumed internally. Greece and Turkey remained the world's leading exporters of perlite.

World Mine Production and Reserves:

	Production[e]		Reserves[5]
	2024	2025	
United States	[6,7]452	[6]460	50,000
Argentina	32	30	NA
Armenia	29	30	NA
China	1,500	1,500	32,000
Georgia	[7]39	40	NA
Greece	840	840	180,000
Hungary[8]	77	80	NA
Iran	70	70	15,000
Mexico[8]	29	30	NA
New Zealand	18	20	NA
Philippines	[7]15	20	NA
Slovakia	[7]42	40	30,000
South Africa	11	10	NA
Turkey[8]	[7]1,360	1,400	NA
Other countries	12	10	NA
World total (rounded)[9]	4,520	4,600	NA

World Resources:[5] Perlite occurrences in Arizona, California, Idaho, Nevada, New Mexico, and Oregon may contain large resources. Significant deposits have been reported in China, Greece, Turkey, and a few other countries. Available information was insufficient to make reliable estimates of resources in many perlite-producing countries.

Substitutes: In construction applications, diatomite, expanded clay and shale, pumice, and slag can be substituted for perlite. For horticultural uses, coco coir, pumice, vermiculite, and wood pulp are alternative soil additives and are sometimes used in conjunction with perlite.

[e]Estimated. NA Not available.
[1]Data for 2023 were rounded to two significant digits to avoid disclosing proprietary information.
[2]Exports and imports were estimated by the U.S. Geological Survey from U.S. Census Bureau combined data for vermiculite, perlite, and chlorites, unexpanded. Data are rounded to two significant digits.
[3]Defined as processed crude perlite sold and used + imports – exports. Data are rounded to two significant digits.
[4]Defined as imports − exports.
[5]See Appendix C for resource and reserve definitions and information concerning data sources.
[6]Processed ore sold and used by producers.
[7]Reported.
[8]Crude ore.
[9]Data may not add to totals shown because of independent rounding.

PHOSPHATE ROCK

(Data in thousand metric tons, marketable phosphate rock, unless otherwise specified)

Domestic Production and Use: In 2025, phosphate rock ore was mined by five companies at 10 mines in four States and processed into an estimated 20 million tons of marketable product, valued at $1.9 billion, free on board (f.o.b.) mine. Phosphate rock was produced in Florida, Idaho, North Carolina, and Utah. Marketable product refers to beneficiated phosphate rock with phosphorus pentoxide (P_2O_5) content suitable for phosphoric acid or elemental phosphorus production. More than 95% of the phosphate rock mined in the United States was used to manufacture wet-process phosphoric acid and superphosphoric acid, which were used as intermediate feedstocks in the manufacture of granular and liquid ammonium phosphate fertilizers and animal feed supplements. About 25% of the wet-process phosphoric acid produced was exported in the form of upgraded granular diammonium phosphate (DAP), monoammonium phosphate (MAP) fertilizer, merchant-grade phosphoric acid, and other phosphate fertilizer products. The balance of phosphate rock mined was for the manufacture of elemental phosphorus, which was used to produce phosphorus compounds for industrial applications, primarily glyphosate herbicide.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production, marketable	21,600	[e]19,800	[e]19,600	[e]19,400	20,000
Sold or used by producers	21,900	[e]19,800	[e]20,000	[e]19,100	18,000
Imports for consumption	2,460	2,500	2,590	3,390	3,400
Consumption, apparent[1]	24,400	[e]22,300	[e]22,600	[e]22,500	21,000
Price, average value, f.o.b. mine,[2] dollars per metric ton	83	[e]99	[e]101	96	100
Stocks, producer, yearend	10,700	[e]10,600	[e]9,550	[e]8,740	8,400
Employment, mine and beneficiation plant, number[e]	2,000	1,900	2,000	2,000	1,900
Net import reliance[3] as a percentage of apparent consumption	11	12	16	18	16

Recycling: None.

Import Sources (2021–24): Peru, >99%; other <1%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Natural calcium phosphates:		
Unground	2510.10.0000	Free.
Ground	2510.20.0000	Free.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: U.S. apparent consumption of phosphate rock in 2025 was estimated to be 7% lower than that in 2024, owing to a decrease in the production of phosphoric acid. Phosphate rock production has been about 20 million tons over the past several years as producers in Florida contend with decreasing reserves and lower P_2O_5 content. This has resulted in an increase in imports over the same period.

Global production of phosphate rock was estimated to be 5% higher than that in 2024, with China, Morocco, the United States, and Russia, in descending order of production, remaining the leading producers. World consumption of P_2O_5 contained in fertilizers was estimated to have been 47.8 million tons in 2025 compared with 47.1 million tons in 2024. World consumption of P_2O_5 in fertilizers was projected to increase to 51.5 million tons by 2029. The leading regions for growth were expected to be Asia and South America.

In October 2025, the U.S. Bureau of Land Management approved a new phosphate rock mine in Caribou County, ID. The new mine will replace an existing mine when that mine is depleted within the next decade.

Global phosphate production capacity, in terms of P_2O_5 content, was projected to increase to 71.7 million tons by 2029 compared with 63.7 million tons in 2025. Capacity expansions to phosphate rock production that were expected to be completed by 2028 were ongoing in Brazil, Kazakhstan, Mexico, Morocco, and Russia. Significant new mining projects that were planned to be completed after 2028 were under development in Canada, Congo (Brazzaville), Guinea-Bissau, and Senegal.

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PHOSPHATE ROCK

On November 7, 2025, the U.S. Final 2025 List of Critical Minerals was published in the Federal Register (90 FR 50494). The changes in the 2025 list from the prior list published in 2022 (87 FR 10381) were the addition of copper, lead, potash, rhenium, silicon, and silver, based on the U.S. Geological Survey updated methodology for the 2025 list. As required by the Energy Act, public comment and interagency input were requested in response to the draft U.S. list of critical minerals published in the Federal Register (90 FR 41591). Based on that input, boron, metallurgical coal, phosphate rock, and uranium were also added.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Morocco, Syria, and Turkey based on company and Government reports. Reserves for Australia, China and Jordan were revised based on company and Government reports.

	Mine production[e]		Reserves[4]
	2024	2025	
United States	19,400	20,000	1,000,000
Algeria	2,000	2,000	2,200,000
Australia	2,500	2,500	[5]800,000
Brazil	5,300	5,000	1,600,000
China[6]	105,000	110,000	3,400,000
Egypt	5,300	5,500	2,800,000
Finland	974	980	1,000,000
India	1,700	1,500	31,000
Israel	2,380	2,400	60,000
Jordan	11,500	12,000	820,000
Kazakhstan	1,700	1,900	260,000
Mexico	365	450	30,000
Morocco	35,300	36,000	50,000,000
Peru	4,800	4,800	210,000
Russia	14,400	14,000	2,400,000
Saudi Arabia	10,000	10,000	1,000,000
Senegal	2,800	2,800	50,000
South Africa	2,220	2,200	1,500,000
Syria	800	800	250,000
Togo	1,560	1,600	30,000
Tunisia	3,280	3,300	2,500,000
Turkey	1,220	1,200	71,000
Uzbekistan	950	950	100,000
Vietnam	3,000	3,000	30,000
Other countries	769	770	800,000
World total (rounded)	239,000	250,000	73,000,000

World Resources:[4] Some world reserves were reported only in terms of ore tonnage and grade. Phosphate rock resources occur principally as sedimentary marine phosphorites. The largest sedimentary deposits are found in northern Africa, the Middle East, China, and the United States. Significant igneous occurrences are found in Brazil, Canada, Finland, Russia, and South Africa. Large phosphate resources have been identified on the continental shelves and on seamounts in the Atlantic Ocean and the Pacific Ocean. World resources of phosphate rock are more than 300 billion tons. There are no imminent shortages of phosphate rock.

Substitutes: There are no substitutes for phosphorus in agriculture.

[e]Estimated.
[1]Defined as phosphate rock sold or used by producers + imports. U.S. producers stopped exporting phosphate rock in 2003.
[2]Marketable phosphate rock, weighted value, all grades.
[3]Defined as imports ± adjustments for industry stock changes.
[4]See Appendix C for resource and reserve definitions and information concerning data sources.
[5]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 120 million tons.
[6]Production data for large mines only, as reported by the National Bureau of Statistics of China.

PLATINUM-GROUP METALS

(Palladium, platinum, iridium, osmium, rhodium, and ruthenium)
[Data in kilograms, platinum-group-metal (PGM) content, unless otherwise specified]

Domestic Production and Use: One company in Montana mined and processed PGMs with an estimated value of $290 million in 2025, a decrease of 31% compared with $420 million in 2024. Estimated total palladium and platinum production decreased by 40% compared with 2024 production owing to one operation remaining on care-and-maintenance status. Small quantities of PGMs also were recovered as byproducts of copper-nickel mining in Michigan; however, this material was exported for refining. The leading domestic use for PGMs was in catalytic converters to decrease harmful emissions from automobiles. PGMs are also used in catalysts for bulk-chemical production and petroleum refining; dental and medical devices; electronic applications, such as in computer hard disks, hybridized integrated circuits, and multilayer ceramic capacitors; glass manufacturing; investment; jewelry; and laboratory equipment.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Mine production:[1]					
Palladium	13,700	10,100	10,300	10,200	6,200
Platinum	4,020	3,000	3,040	3,010	1,800
Imports for consumption:[2]					
Palladium	72,600	65,200	66,900	68,300	92,000
Platinum	67,900	64,200	66,800	70,500	99,000
PGM waste and scrap	160,000	41,500	32,100	52,800	150,000
Iridium	2,310	1,610	2,040	1,360	2,200
Osmium	1	1	—	1	57
Rhodium	16,500	13,200	12,100	14,500	14,000
Ruthenium	18,000	13,300	10,800	9,780	14,000
Exports:[3]					
Palladium	43,900	42,200	33,600	39,900	18,000
Platinum	29,400	23,100	11,300	11,700	17,000
PGM waste and scrap	37,800	35,200	13,900	13,600	24,000
Rhodium	1,350	717	453	766	340
Other PGMs	2,180	1,010	845	2,050	2,700
Consumption, apparent:[4, 5]					
Palladium	81,400	74,100	88,500	83,600	130,000
Platinum	51,100	52,900	67,100	68,900	92,000
Price, dollars per troy ounce:[6]					
Palladium	2,419.18	2,133.81	1,351.66	994.90	1,100
Platinum	1,094.31	966.54	973.00	960.70	1,200
Iridium	5,158.40	4,581.93	4,672.78	4,810.40	4,400
Rhodium	20,254.10	15,585.00	6,660.58	4,660.44	5,800
Ruthenium	576.12	577.02	466.49	451.02	690
Employment, mine, number	1,600	1,560	1,450	901	810
Net import reliance[5, 7] as a percentage of apparent consumption:					
Palladium	35	31	38	34	57
Platinum	75	78	83	85	89

Recycling: About 140,000 kilograms of palladium and platinum were recovered globally from new and old scrap in 2025, including about 50,000 kilograms of palladium and 8,600 kilograms of platinum recovered from automobile catalytic converters in the United States.

Import Sources (2021–24): Palladium: South Africa, 37%; Russia, 36%; Belgium, 6%; Canada, 6%, and other, 15%. Platinum: South Africa, 49%; Belgium, 10%; Germany, 10%; Italy, 8%; and other, 23%.

Tariff: All unwrought and semimanufactured forms of PGMs are imported duty free under normal trade relations. See footnote 2 for specific Harmonized Tariff Schedule of the United States codes.

Depletion Allowance:[8] 22% (domestic), 14% (foreign).

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PLATINUM-GROUP METALS

Government Stockpile:[8]

	FY 2025		FY 2026	
Material	**Potential acquisitions**	**Potential disposals**	**Potential acquisitions**	**Potential disposals**
Iridium	—	15	NA	NA
Platinum	—	261	NA	NA

Events, Trends, and Issues: In 2025, production of PGMs in South Africa, the world's leading producer of PGM-containing mined material, decreased by an estimated 9% compared with that in 2024 owing to declining palladium prices, higher costs associated with deep-level mining, and ongoing disruptions to the supply of electricity. Estimated production in Russia, the world's leading producer of mined palladium, decreased by 6% owing to lower metal grades and ore recovery, geopolitical and investor uncertainty related to the Russia-Ukraine conflict, and the introduction of new mining equipment at one operation.

The estimated annual average price in 2025 increased by 53% for ruthenium, by 25% for platinum, by 24% for rhodium, and by 11% for palladium compared with the average prices in 2024. The estimated annual price of iridium decreased by 9% compared with annual average price in 2024. Price increases were attributed to decreased production and increased demand, particularly for rhodium in the hard disk and chemical catalyst industries and owing to the substitution of platinum in automobile catalysts. Investment uncertainty and volatility may have also contributed to price increases. The price decrease for iridium may have been affected by increased production and the waning of investor enthusiasm in the hydrogen power market.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Russia and South Africa based on company and Government reports. Reserves for the United States, Russia, and Zimbabwe were revised based on company and Government reports.

	Mine production				PGM reserves[9]
	Palladium		Platinum		
	2024	2025[e]	2024	2025[e]	
United States	10,200	6,200	3,010	1,800	590,000
Canada	17,000	16,000	5,700	5,000	310,000
Russia[e]	89,000	84,000	22,000	20,000	[10]11,000,000
South Africa	82,600	70,000	126,000	120,000	63,000,000
Zimbabwe	15,200	15,000	18,400	18,000	1,300,000
Other countries	2,870	2,900	3,860	3,900	NA
World total (rounded)	217,000	190,000	179,000	170,000	>76,000,000

World Resources:[9] World resources of PGMs are estimated to total more than 100 million kilograms. The largest resources and reserves are in the Bushveld Complex in South Africa.

Substitutes: Palladium has been used as a substitute for platinum in most gasoline-engine catalytic converters because of the historically lower price for palladium relative to that of platinum. About 25% of palladium can routinely be substituted for platinum in diesel catalytic converters; the proportion can be as much as 50% in some applications. For some industrial end uses, one PGM can substitute for another, but with losses in efficiency.

[e]Estimated. NA Not available. — Zero.
[1]Estimated from published sources.
[2]Includes data for the following Harmonized Tariff Schedule of the United States codes: 7110.11.0010, 7110.11.0020, 7110.11.0050, 7110.19.0000, 7110.21.0000, 7110.29.0000, 7110.31.0000, 7110.39.0000, 7110.41.0010, 7110.41.0020, 7110.41.0030, 7110.49.0010, and 7118.90.0020; 7112.92.0000 (2021); and 7112.92.0100 (2022–25).
[3]Includes data for the following Schedule B numbers: 7110.11.0000, 7110.19.0000, 7110.21.0000, 7110.29.0000, 7110.31.0000, 7110.39.0000, 7110.41.0000, and 7110.49.0000; 7112.92.0000 (2021); and 7112.92.0100 (2022–25).
[4]Defined as primary production + secondary production + imports – exports.
[5]Excludes imports and (or) exports of waste and scrap.
[6]Engelhard unfabricated metal average annual prices. Source: S&P Global Platts Metals Week.
[7]Defined as imports – exports.
[8]See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.
[9]See Appendix C for resource and reserve definitions and information concerning data sources.
[10]Reserves for Russia are based on the State Committee of Reserves of the Russian Federation (GKZ) classification system A+B+C1+C2, where C2 are reserves in deposits that are indicated but not being developed or prepared for development. C2 reserves were excluded here.

POTASH

[Data in thousand metric tons, potassium oxide (K_2O) equivalent, unless otherwise specified]

Domestic Production and Use: In 2025, the estimated sales value of marketable potash, free on board (f.o.b.) mine, was $550 million, which was 13% higher than that in 2024. The majority of U.S. production was from southeastern New Mexico, where two companies operated two underground mines and one deep-well solution mine. Sylvinite and langbeinite ores in New Mexico were beneficiated by flotation, dissolution-recrystallization, heavy-media separation, solar evaporation, and (or) combinations of these processes. In Utah, two companies operated three facilities. One company extracted underground sylvinite ore by deep-well solution mining. Solar evaporation crystallized the sylvinite ore from the brine solution, and a flotation process separated the muriate of potash (MOP) from byproduct sodium chloride. The firm also processed subsurface brines by solar evaporation and flotation to produce MOP at its other facility. Another company processed brine from the Great Salt Lake by solar evaporation to produce potassium sulfate or sulfate of potash (SOP) and other byproducts.

Potash denotes a variety of mined and manufactured salts that contain the element potassium in water-soluble form. In agriculture, the term potash refers to potassic fertilizers, which are potassium chloride (KCl), SOP, and potassium magnesium sulfate (SOPM) or langbeinite. MOP is an agriculturally acceptable mix of KCl (95% pure or greater) and sodium chloride for fertilizer use. The fertilizer industry used about 85% of U.S. potash sales, and the remainder was used for chemical and industrial applications. More than 60% of the potash produced was SOPM and SOP, which are required to fertilize certain chloride-sensitive crops. The remainder of production was MOP and was used for agricultural and chemical applications.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production, marketable[1]	480	430	390	410	500
Sales by producers, marketable[1]	490	400	400	420	460
Imports for consumption	6,480	4,940	5,620	5,970	5,600
Exports	112	267	157	150	170
Consumption, apparent[1, 2]	6,900	5,100	5,900	6,200	5,900
Price, average, f.o.b. mine, dollars per metric ton of K_2O equivalent:					
All products[3]	1,120	1,790	1,250	1,150	1,200
MOP	650	980	620	690	600
Employment, mine and mill, number[e]	900	900	900	900	900
Net import reliance[4] as a percentage of apparent consumption	93	92	93	94	92

Recycling: None.

Import Sources (2021–24): Canada, 79%; Russia, 12%; Israel, 3%; and other, 6%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Potassium nitrate	2834.21.0000	Free.
Potassium chloride, less than or equal to 62% K_2O	3104.20.0010	Free.
Potassium chloride, greater than 62% K_2O	3104.20.0050	Free.
Potassium sulfate	3104.30.0000	Free.
Potassic fertilizers, other	3104.90.0100	Free.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: In 2025, domestic production, sales, and exports were estimated to have increased compared with those in 2024. Apparent consumption and imports were both lower than those in 2024. World consumption of potash in fertilizer was estimated to be 41.6 million tons of K_2O, compared with 40.6 million tons in 2024. Asia and South America were the regions with the highest growth in consumption. World consumption was projected to increase to 45.3 million tons in 2029.

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POTASH

In January 2025, a Michigan-based company received a conditional commitment from the U.S. Department of Energy for a $1.26 billion loan to help finance the development of a new potash and salt mine in Osceola County, MI. The company is required to meet certain environmental, financial, legal, and technical conditions within 1 year before the loan can be approved. The new mine was planned to have an initial annual production capacity of 800,000 tons of MOP and 1 million tons of salt.

World annual potash production capacity was 66.1 million tons of K_2O in 2025 and projected to increase to 77.4 million tons of K_2O by 2029. Most of the increase would be MOP from new mines and expansion projects in Laos and Russia. New MOP mines in Belarus, Brazil, Canada, Ethiopia, Morocco, and Spain were planned to begin operation beyond 2029.

On November 7, 2025, the U.S. Final 2025 List of Critical Minerals was published in the Federal Register (90 FR 50494). The changes in the 2025 list from the prior list published in 2022 (87 FR 10381) were the addition of copper, lead, potash, rhenium, silicon, and silver, based on the U.S. Geological Survey updated methodology for the 2025 list. As required by the Energy Act, public comment and interagency input were requested in response to the draft U.S. list of critical minerals published in the Federal Register (90 FR 41591). Based on that input, boron, metallurgical coal, phosphate rock, and uranium were also added.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Belarus, Germany, and Laos based on company and industry reports. Reserves for China and Russia were revised based on Government reports.

	Mine production		Reserves[5]	
	2024	2025[e]	Recoverable ore	K_2O equivalent
United States[1]	410	500	970,000	220,000
Belarus	[e]5,000	6,000	3,300,000	750,000
Brazil	331	300	10,000	2,300
Canada	14,400	15,000	4,500,000	1,100,000
Chile	564	600	NA	100,000
China	[e]6,300	6,300	NA	200,000
Germany	[e]2,500	3,000	NA	150,000
Israel	2,260	2,000	NA	[6]Large
Jordan	1,730	1,800	NA	[6]Large
Laos	[e]2,400	2,400	NA	1,000,000
Russia	[e]10,000	10,000	NA	2,000,000
Spain	489	450	NA	100,000
Other countries	350	350	1,500,000	300,000
World total (rounded)	46,700	49,000	>10,000,000	>5,900,000

World Resources:[5] Estimated domestic potash resources total about 7 billion tons. Most of these lie at depths between 1,800 and 3,100 meters in a 3,110-square-kilometer area of Montana and North Dakota as an extension of the Williston Basin deposits in Manitoba and Saskatchewan, Canada. The Paradox Basin in Utah contains resources of about 2 billion tons, mostly at depths of more than 1,200 meters. The Holbrook Basin of Arizona contains resources of about 0.7 billion to 2.5 billion tons. A large potash resource lies about 2,100 meters under central Michigan and contains more than 75 million tons. Estimated world resources total about 250 billion tons.

Substitutes: No substitutes exist for potassium as an essential plant nutrient and as an essential nutritional requirement for animals and humans. Manure and glauconite (greensand) are low-potassium-content materials that can be profitably transported only short distances to crop fields. Glauconite is used as a potassium source for organic farming.

[e]Estimated. NA Not available.
[1]Data are rounded to no more than two significant digits to avoid disclosing company proprietary data.
[2]Defined as sales + imports – exports.
[3]Includes MOP, SOP, and SOPM. Does not include other chemical compounds that contain potassium.
[4]Defined as imports – exports.
[5]See Appendix C for resource and reserve definitions and information concerning data sources.
[6]Israel and Jordan recover potash from the Dead Sea, which contains nearly 2 billion tons of potassium chloride.

PUMICE AND PUMICITE

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: In 2025, 10 operations in five States produced pumice and pumicite. Estimated production[1] was 430,000 tons with an estimated processed value of $19 million, free on board (f.o.b.) plant. That represented an increase in both quantity and value from the 2024 reported production of 410,000 tons valued at $18.2 million. Pumice and pumicite were mined in California, Idaho, Kansas, New Mexico, and Oregon. The porous, lightweight properties of pumice are well suited for its main uses. Mined pumice was used in the production of abrasives, concrete admixtures and aggregates, lightweight building blocks, horticultural purposes, and other uses, including absorbent, filtration, laundry stone washing, and road use.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production, mine[1]	504	295	438	410	430
Imports for consumption	87	103	53	144	64
Exports	11	14	11	11	15
Consumption, apparent[2]	580	384	480	543	480
Price, average unit value, f.o.b. mine or mill, dollars per metric ton	46	65	41	42	44
Employment, mine and mill, number	140	140	140	140	140
Net import reliance[3] as a percentage of apparent consumption	13	23	9	24	10

Recycling: Little to no known recycling.

Import Sources (2021–24): Greece, 80%; Iceland, 9%; Norway, 4%; Poland, 3%; and other, 4%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Pumice, crude or in irregular pieces, including crushed	2513.10.0010	Free.
Pumice, other	2513.10.0080	Free.

Depletion Allowance: 5% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: The amount of domestically produced pumice and pumicite sold or used in 2025 was estimated to be 5% more than that in 2024. Imports were estimated to have decreased and exports were estimated to have increased compared with those in 2024. An estimated 80% of all imported pumice originated from Greece in 2025 and primarily supplied markets in the eastern and gulf coast regions of the United States.

Pumice and pumicite are plentiful in the Western States, but legal challenges and public land designations could limit access to known deposits. Production of pumice and pumicite is sensitive to mining and transportation costs.

All known domestic pumice and pumicite mining in 2025 was accomplished through open pit methods, generally in remote areas away from major population centers. Although the generation and disposal of reject fines in mining and milling may result in local dust issues at some operations, such environmental impacts were estimated to be restricted to small geographic areas.

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PUMICE AND PUMICITE

World production of pumice and related material was estimated to be 20 million tons in 2025, which was less than the 20.2 million tons produced in 2024. Turkey was the leading global producer of pumice and pumicite, followed by Jordan. Pumice is used more extensively as a building material outside the United States, which explains the large global production of pumice relative to that of the United States. In Europe, basic home construction uses stone and concrete as the preferred building materials. Prefabricated lightweight concrete walls, which may contain pumice as lightweight aggregate, are often produced and shipped to construction locations. Because of their cementitious properties, light weight, and strength, pumice and pumicite perform well in European-style construction.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Cameroon, Chile, Spain, Tanzania, and Turkey based on company and Government reports.

	Mine production[e]		Reserves[4]
	2024	2025	
United States[1]	[5]410	430	Large in the United States. Quantitative estimates of reserves for most countries were not available.
Algeria[6]	900	900	
Cameroon[6]	370	370	
Chile[6]	530	530	
Ecuador	800	800	
Ethiopia	510	510	
France[6]	280	280	
Greece[6]	1,010	1,000	
Guatemala	570	570	
Jamaica	290	290	
Jordan[6]	1,100	1,100	
Saudi Arabia[6]	980	980	
Spain	300	300	
Tanzania[6]	350	350	
Turkey	9,700	9,700	
Uganda[6]	830	830	
Other countries[6]	1,300	1,100	
World total (rounded)	20,200	20,000	

World Resources:[4] The identified U.S. resources of pumice and pumicite, estimated to be more than 25 million tons, are concentrated in the Western States. The estimated total resources (identified and undiscovered) in the Western and Great Plains States are at least 250 million tons and may total more than 1 billion tons. Large resources of pumice and pumicite have been identified on all continents.

Substitutes: The costs of transportation determine the maximum economic distance pumice and pumicite can be shipped and still remain competitive with alternative materials. Competitive materials that may be substituted for pumice and pumicite include crushed aggregates, diatomite, expanded shale and clay, and vermiculite.

[e]Estimated.
[1]Quantity sold and used by producers.
[2]Defined as production + imports – exports.
[3]Defined as imports – exports.
[4]See Appendix C for resource and reserve definitions and information concerning data sources.
[5]Reported.
[6]Includes pozzolan and (or) volcanic tuff.

QUARTZ (HIGH-PURITY AND INDUSTRIAL CULTURED CRYSTAL)

(Data in metric tons unless otherwise specified)

Domestic Production and Use: Ground high-purity quartz (HPQ) is generally defined as natural quartz containing less than 100 parts per million (ppm) of total impurities, equivalent to a purity level of 99.99%. Some ultra-high-purity quartz products contain less than 10 ppm of impurities (99.999% pure). HPQ is further defined by the concentration limits of specific trace elements, which depend on end-use requirements. HPQ has specialized end uses including electronics, fiber-optic cables, fused quartz crucibles (for manufacturing silicon metal ingots that are later processed into silicon wafers for the photovoltaic cell and semiconductor markets), high-temperature lamp tubing, and specialty glass. In 2025, there were two companies that produced HPQ in the United States around Spruce Pine, NC. The HPQ in Spruce Pine was sourced from pegmatite rocks that were concurrently mined to produce feldspar and mica. The pegmatite was processed through a number of procedures that involved crushing, washing and scrubbing, and sorting. Additional processing for the HPQ included physical processing, chemical processing, and thermal processing. At least one of these companies sent their product overseas for further processing.

Industrial cultured quartz crystal is electronic-grade quartz crystal that is manufactured, not mined. In the past, cultured quartz crystal was primarily produced using lascas[1] as raw quartz feed material. Lascas mining and processing in Arkansas ended in 1997. In 2025, two companies produced cultured quartz crystal in the United States. However, production data were withheld in order to avoid disclosing company proprietary data. In addition to lascas, these companies may use cultured quartz crystal that has been rejected during the manufacturing process, owing to crystallographic imperfections, as feed material. The companies likely use a mix of cultured quartz and imported lascas as feed material. In the past several years, cultured quartz crystal has been increasingly produced overseas, primarily in Asia. Electronic applications accounted for most industrial uses of quartz crystal; other uses included special optical applications. Virtually all quartz crystal used for electronics was cultured, rather than natural, crystal. Electronic-grade quartz crystal is used to make frequency controls, frequency filters, and timers in electronic circuits employed for a wide range of products, such as communications equipment, computers, and many consumer goods, such as electronic games and television receivers.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Ground high-purity quartz:					
Sold or used[e, 2]	100,000	100,000	200,000	200,000	100,000
Imports[3]	NA	NA	NA	NA	NA
Exports[3]	NA	NA	NA	NA	NA
Price, range of value, dollars per metric ton[e, 4, 5]	500–16,000	500–17,000	500–20,000	500–17,000	500–12,000
Net import reliance[6] as a percentage of apparent consumption	NA	NA	NA	NA	NA
Industrial cultured quartz crystal:					
Sold or used	W	W	W	W	W
Imports, piezoelectric	69	76	87	127	70
Exports, piezoelectric	39	76	133	98	45
Price, as-grown cultured quartz, dollars per kilogram[e, 4]	100	100	200	200	200
Price, lumbered quartz, dollars per kilogram[e, 4, 7]	300	300	400	500	500
Net import reliance[6] as a percentage of apparent consumption	>50	0	E	>50	>50

Recycling: An unspecified amount of rejected cultured quartz crystal was used as feed material for the production of cultured quartz crystal.

Import Sources (2021–24): Import statistics specific to lascas and HPQ were not available because they were combined with other types of quartz. Cultured quartz crystal (piezoelectric quartz, unmounted): China,[8] 89%; Denmark and Japan, 3% each; and other, 5%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Sand containing 95% or more silica and not more than 0.6% iron oxide (including HPQ)	2505.10.1000	Free.
Quartz (including lascas and HPQ)	2506.10.0050	Free.
Piezoelectric quartz, unmounted	7104.10.0000	3% ad valorem.

Depletion Allowance: 22% (domestic), 14% (foreign).

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QUARTZ (HIGH-PURITY AND INDUSTRIAL CULTURED CRYSTAL)

Government Stockpile:[9]

	FY 2025		FY 2026	
Material	**Potential acquisitions**	**Potential disposals**	**Potential acquisitions**	**Potential disposals**
Quartz crystal, kilograms	—	7,127	NA	NA

Events, Trends, and Issues: Increased global manufacturing of silicon metal ingots that are later processed into silicon wafers for the photovoltaic cell and semiconductor markets has increased the demand for HPQ needed to make fused quartz crucibles in recent years. In 2024, continuing into 2025 there was a decrease in demand for HPQ for photovoltaic cells. In 2025, the HPQ industry was affected by ongoing tariff negotiations between the United States and China. Despite this, growth of the semiconductor, electronics, fiber optics, and specialty glass markets are likely to remain a factor in sustaining and increasing global demand for HPQ. Both HPQ companies in the United States continued capacity expansion plans in 2025.

On April 10, China's Ministry of Natural Resources announced over 35 million tons of HPQ reserves in Henan and Xinjiang. It was reported that initial tests achieved HPQ grades of 99.995% to 99.998% purity, compared with the greater than 99.999% pure HPQ that is sourced from Spruce Pine, NC.

Increased trade of piezoelectric quartz in the past several years was likely the result of increased demand for frequency-control oscillators and vibration sensors for aerospace, automotive, and telecommunication applications. Growth of the consumer electronics market (for example, communications equipment, electronic games, personal computers, and tablet computers) is also likely to remain a factor in sustaining global demand for cultured quartz crystal. In 2025, piezoelectric quartz crystal trade was affected by ongoing tariff negotiations between the United States and China.

World Mine Production and Reserves:[10] This information was not available. Global reserves of HPQ were estimated to be limited to a few locations. The United States was estimated to be the leader in production of HPQ with other sources being Australia, Brazil, Canada, China, India, and Russia. The global reserves for lascas were estimated to be large. The majority of lascas was mined in Brazil and Madagascar.

World Resources:[10] Limited resources of HPQ exist throughout the world. Limited resources of natural quartz crystal suitable for direct electronic or optical use exist throughout the world. World dependence on natural quartz crystal resources will continue to decline because of the increased acceptance of cultured quartz crystal as an alternative material. Additionally, techniques using rejected cultured quartz crystal as feed material may result in decreased dependence on lascas for growing cultured quartz.

Substitutes: No economic substitutes or alternatives for HPQ exist for most applications. Cultured quartz can be used as a substitute for HPQ, although it is not commonly done owing to the high price of cultured quartz.

Silicon is increasingly being used as a substitute for quartz crystal for frequency-control oscillators in electronic circuits. Other materials, such as aluminum orthophosphate (the very rare mineral berlinite), langasite, lithium niobate, and lithium tantalate, which have larger piezoelectric coupling constants, have been studied and used. Centrosymmetric materials that have induced piezoelectricity have also been studied. The cost competitiveness of these materials, as opposed to cultured quartz crystal, is dependent on the type of application that the material is used for, and the processing required.

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.
[1]Lascas is a nonelectronic-grade quartz used as a feedstock for growing cultured quartz crystal and for production of fused quartz. Lascas data are not included in this publication.
[2]Production is estimated from a combination of publicly available data, published sources, industry sources, and industry trends. Data are rounded to the nearest 100,000 tons to avoid disclosing company proprietary data.
[3]Trade data for ground high-purity quartz are included in Harmonized Tariff Schedule of the United States (HTS) codes 2505.10.1000 and 2506.10.0050 but are mixed with other types of sand and quartz. A reliable estimate cannot be made.
[4]Price is estimated from a combination of reported prices, trade data prices, and industry trends.
[5]Prices vary based on the percentage of quartz, percentage and type of impurities, and end use of the ground high-purity quartz.
[6]Defined as imports – exports.
[7]As-grown cultured quartz that has been processed by sawing and grinding.
[8]Includes Hong Kong.
[9]See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.
[10]See Appendix C for resource and reserve definitions and information concerning data sources.

RARE EARTHS[1]

[Data in metric tons, rare-earth-oxide (REO) equivalent, unless otherwise specified]

Domestic Production and Use: Rare earths were mined and processed domestically in 2025. An estimated 51,000 tons of REO in mineral concentrates was produced and was valued at $240 million. Bastnaesite was mined as a primary product in Mountain Pass, CA. Monazite was produced from heavy-mineral-sand concentrates in the southeastern United States. Rare-earth compounds were also produced in the Western United States. U.S. imports of rare-earth compounds and metals increased by 169% in 2025; however, the estimated value of these imports decreased to $165 million from $168 million in 2024, reflecting a shift toward lower-value imported products. The estimated leading domestic end use of rare earths was catalysts, whereas the estimated leading global use was magnets. Other end uses included batteries, ceramics and glass, metallurgical applications and alloys, and polishing. A significant amount of imported rare earths was embedded in finished goods.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production:[e]					
Mineral concentrates[2]	42,400	42,500	41,600	45,500	51,000
Compounds and metals[e, 3]	120	95	800	4,300	8,900
Imports:[e, 4]					
Compounds	7,730	10,800	8,970	8,120	21,000
Metals:					
Ferrocerium, alloys	330	395	259	238	1,100
Rare-earth metals and alloys	579	487	476	96	350
Exports:[e, 4]					
Ores and compounds	45,700	45,900	20,700	37,500	14,000
Metals:					
Ferrocerium, alloys	825	1,520	817	902	890
Rare-earth metals and alloys	20	24	63	347	430
Consumption, apparent, compounds and metals[5]	7,900	10,200	8,600	9,010	27,000
Price, average, dollars per kilogram:[6]					
Lanthanum oxide, 99.5% minimum	1.51	1.39	0.96	0.97	1.00
Cerium oxide, 99.5% minimum	1.54	1.45	1.03	1.21	1.71
Mischmetal, 65% cerium, 35% lanthanum	5.66	6.52	5.47	5.45	5.62
Praseodymium oxide, 99.99% minimum	93	128	76	56	74
Neodymium oxide, 99.5% minimum	98	134	78	56	73
Neodymium-praseodymium (NdPr) oxide, 99% minimum	92	124	75	55	69
Samarium oxide, 99.5% minimum	2.03	3.34	2.17	2.01	2.82
Europium oxide, 99.99% minimum	31	30	27	27	27
Gadolinium oxide, 99.99% minimum	47	75	47	28	30
Employment, mine and mill, annual average, number	293	350	450	570	670
Net import reliance[7] as a percentage of apparent consumption:					
Compounds and metals	>95	>95	>90	53	67
Mineral concentrates	E	E	E	E	E

Recycling: Limited quantities of rare earths were recovered from batteries, permanent magnets, and fluorescent lamps.

Import Sources (2021–24): Rare-earth compounds and metals: China,[8] 71%; Malaysia, 13%; Japan, 5%; Estonia, 5%; and other, 6%. Compounds and metals imported from Estonia, Japan, and Malaysia were derived from mineral concentrates and chemical intermediates produced in Australia, China, and elsewhere.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Rare-earth metals	2805.30.0000	5% ad valorem.
Cerium compounds	2846.10.0000	5.5% ad valorem.
Other rare-earth compounds:		
Oxides or chlorides	2846.90.2000	Free.
Carbonates	2846.90.8000	3.7% ad valorem.
Ferrocerium and other pyrophoric alloys	3606.90.3000	5.9% ad valorem.

Depletion Allowance: Monazite, 22% on thorium content and 14% on rare-earth content (domestic), 14% (foreign); bastnaesite and xenotime, 14% (domestic and foreign).

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RARE EARTHS

Government Stockpile:[9] In addition to the materials listed below, the fiscal year (FY) 2025 potential acquisitions included 300 tons of neodymium-praseodymium oxide, 450 tons of neodymium-iron-boron magnet block, and 60 tons of samarium-cobalt alloy. Information for FY 2026 potential acquisitions was not available.

	FY 2025		FY 2026	
Material	Potential acquisitions	Potential disposals	Potential acquisitions	Potential disposals
Lanthanum	1,100	—	NA	NA

Events, Trends, and Issues: In April 2025, China tightened its export controls on rare-earth elements, adding specific controls on alloys, compounds, metals, and oxides of samarium, gadolinium, terbium, dysprosium, lutetium, scandium, and yttrium. In October, China expanded its rare-earths export controls to include europium, holmium, erbium, thulium, and ytterbium. In November, China suspended the October export controls for 1 year. The April export controls remained in effect, although China began to issue general export licenses to selected exporters.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Australia, Brazil, Burma, Madagascar, Nigeria, and Vietnam based on Government and industry reports. Reserves for Australia, Brazil, and Malaysia were revised based on Government reports.

	Mine production[e]		Reserves[10]
	2024	2025	
United States	[11]45,500	51,000	1,900,000
Australia	29,000	29,000	[13]6,300,000
Brazil	560	2,000	11,000,000
Burma	[12]27,000	[12]22,000	NA
Canada	—	—	830,000
China	270,000	270,000	44,000,000
Greenland	—	—	1,500,000
India	2,900	2,900	[14]NA
Madagascar	[12]1,400	[12]2,700	NA
Malaysia	[12]140	[12]110	710,000
Nigeria	1,500	1,500	NA
Russia	2,600	2,600	3,800,000
South Africa	—	—	860,000
Tanzania	—	—	890,000
Thailand	[12]2,100	[12]4,800	NA
Vietnam	[12]300	[12]150	3,500,000
Other	1,000	550	NA
World total (rounded)	380,000	390,000	>75,000,000

World Resources:[10] Rare earths are relatively abundant in the Earth's crust, but minable concentrations are less common than for most other mineral commodities. In North America, measured and indicated resources of rare earths were estimated to include 3.6 million tons in the United States and more than 14 million tons in Canada.

Substitutes: Substitutes are available for many applications but generally are less effective.

[e]Estimated. E Net exporter. NA Not available. — Zero.
[1]Data include lanthanides and yttrium but exclude most scandium. See also the Rare Earths (Heavy), Scandium, and Yttrium chapters.
[2]Excludes monazite concentrates.
[3]Production includes compounds from California and Utah. Data are rounded to two significant digits.
[4]REO equivalent or content of various materials were estimated. Source: U.S. Census Bureau.
[5]Defined as production + imports – exports.
[6]Free on board. Source: Argus Media group, Argus Non-Ferrous Markets.
[7]Defined as imports – exports.
[8]Includes Hong Kong.
[9]Gross weight. See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.
[10]See Appendix C for resource and reserve definitions and information concerning data sources.
[11]Reported.
[12]Estimated based on reported import data for China. Source: Trade Data Monitor Inc.
[13]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 3.3 million tons.
[14]A 2015 report from OSCOM indicated that monazite reserves from their operations were 256,000 tons; rare-earth reserves were not reported.

RARE EARTHS (HEAVY)[1]

[Data in metric tons, rare-earth-oxide (REO) equivalent, unless otherwise specified]

Domestic Production and Use: Terbium, dysprosium, holmium, erbium, thulium, ytterbium, and lutetium are heavy rare-earth elements, in order of atomic number. Minerals containing heavy rare earths were mined domestically in 2025. At least five companies were developing commercial-scale heavy-rare-earth processing and refining capacity and at least one company developed commercial-scale capacity for a specific heavy-rare-earth compound; several produced small-scale quantities of heavy-rare-earth compounds and metals in 2025, although none produced sustained commercial-scale quantities. Heavy rare earths were used in a variety of applications, including catalysts for petroleum refining, fiber optics, high-strength magnets, industrial and medical lasers, and medical and scientific equipment such as portable X-rays. End use varied by element. A significant amount of imported heavy rare earths was embedded in finished goods.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Imports, compounds and metals:[e, 2]	71	70	70	74	100
Price, average, dollars per kilogram:[3]					
Terbium oxide, 99.99% minimum	1,340	2,050	1,300	812	1,010
Dysprosium oxide, 99.5% minimum	410	382	330	257	239
Holmium oxide, 99.5% minimum	140	180	91	67	70
Erbium oxide, 99.5%, minimum	36	53	41	43	46
Ytterbium oxide, 99.99% minimum	15	14	13	14	15
Lutetium oxide, 99.99% minimum,	811	814	829	780	888
Net import reliance[4] as a percentage of apparent consumption, compounds and metals:	100	100	100	100	100

Recycling: Small quantities of heavy rare earths were recovered from permanent magnets.

Import Sources (2021–24): Although there are no domestic trade codes for individual heavy-rare-earth materials, shipping records indicated that the United States imported heavy rare earths. Terbium compounds and metals: China, 100%. Holmium compounds and metals: China, 100%. Erbium compounds and metals: Germany, 51%; China, 40%; and Netherlands, 9%. Ytterbium compounds and metals: China, 86%; Germany, 4%; Chile, 4%; Republic of Korea, 3%; and other, 3%. Lutetium compounds and metals: China,[5] 100%. Compounds and metals imported from Chile, Germany, Japan, the Republic of Korea, and the Netherlands were derived from mineral concentrates and chemical intermediates produced elsewhere. Import sources do not include heavy rare earths contained in value-added intermediates and finished products.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Rare-earth metals, unspecified:		
Not alloyed	2805.30.0050	5% ad valorem.
Alloyed	2805.30.0090	5% ad valorem.
Other rare-earth compounds:		
Oxides	2846.90.2040	Free.
Chlorides	2846.90.2084	Free.
Carbonates	2846.90.8075	3.7% ad valorem.
Other	2846.90.8090	3.7% ad valorem.

Depletion Allowance: Monazite, 22% on thorium content and 14% on rare-earth content (domestic), 14% (foreign); bastnaesite and xenotime, 14% (domestic and foreign).

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RARE EARTHS (HEAVY)

Government Stockpile: None.

Events, Trends, and Issues: In April 2025, China tightened its export controls on rare-earth elements, adding specific controls on metals, oxides, alloys, and compounds of terbium, dysprosium, lutetium, and other rare earths. In early October, China expanded its rare-earth export controls to include all heavy-rare-earth elements. However, in November, China suspended the early October export controls for 1 year. As of December 2025, the April export controls remained in effect, although China began to issue general export licenses to selected exporters.

In August, the U.S. Department of War (DOW) provided a rare-earths producer in Mountain Pass, CA, with a $150 million direct loan to construct a heavy-rare-earths separation facility. In 2025, the DOW provided an $80 million loan to one recycler in Marion, IN, and awarded $5.1 million to another recycler in Houston, TX, to recover rare earths, including terbium and dysprosium.

In October, an Australian producer announced its intent to construct a new facility in Malaysia to separate heavy rare earths, including terbium, dysprosium, and lutetium.

A mine in Brazil produced mixed concentrates from ionic clays with elevated terbium and dysprosium. In November, the U.S. International Development Finance Corporation approved a $465 million loan to the company to increase production of heavy rare earths.

World Mine Production and Reserves: See the Rare Earths chapter.

World Resources:[6] Rare earths are relatively abundant in the Earth's crust, but minable concentrations are less common than for most other mineral commodities. Heavy rare earths are less abundant than light rare earths but are elevated in some ores, including ion-adsorption clays.

Substitutes: Substitutes are available for some applications but are generally less effective. Light rare earths can substitute for heavy rare earths in several applications.

[e]Estimated.
[1]Yttrium is considered a heavy-rare-earth element but is excluded from these data. See also the Rare Earths and Yttrium chapters.
[2]REO equivalent or content of various materials were estimated from Trade Mining LLC shipping records.
[3]Free on board. Sources: Argus Media group, Argus Non-Ferrous Markets and Asian Metal Ltd.
[4]Defined as imports – exports. Quantitative export data were not available.
[5]Includes Hong Kong.
[6]See Appendix C for resource and reserve definitions and information concerning data sources.

RHENIUM

(Data in kilograms, rhenium content, unless otherwise specified)

Domestic Production and Use: During 2025, rhenium-containing products including ammonium perrhenate (APR), metal powder, and perrhenic acid were produced as byproducts from roasting molybdenum concentrates from porphyry copper-molybdenum deposits in Arizona and Montana. Total estimated U.S. primary production increased by 5% to 9,800 kilograms in 2025 compared with 9,310 kilograms in 2024. The United States continued to be a leading producer of secondary rhenium, recovering rhenium from nickel-base superalloy scrap, spent oil-refining catalysts, and foundry revert. The major uses of rhenium were in superalloys used in high-temperature turbine engine components and in petroleum-reforming catalysts, representing an estimated 80% and 15%, respectively, of end uses. Bimetallic platinum-rhenium catalysts were used in petroleum reforming to produce high-octane hydrocarbons, which are used in the production of lead-free gasoline. Rhenium improves the high-temperature (>1,000 degrees Celsius) strength properties of some nickel-base superalloys. Rhenium alloys were used in crucibles, electrical contacts, electromagnets, electron tubes and targets, heating elements, ionization gauges, mass spectrographs, metallic coatings, semiconductors, temperature controls, thermocouples, vacuum tubes, and other applications.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production[1]	9,290	8,870	9,410	9,310	9,800
Imports for consumption:					
Rhenium, unwrought and powders[2]	15,900	11,000	10,200	12,600	23,000
Ammonium perrhenate[3]	6,020	8,810	4,890	7,450	7,800
Exports	—	92	689	735	2,200
Consumption, apparent[4]	31,200	28,600	23,800	28,700	38,000
Price, average value, gross weight, dollars per kilogram:[5]					
Metal, 99.99% pure	977	1,120	1,070	1,360	2,600
Ammonium perrhenate	866	911	920	1,290	2,300
Employment, number	Small	Small	Small	Small	Small
Net import reliance[6] as a percentage of apparent consumption	70	69	61	68	75

Recycling: Nickel-base superalloy scrap and scrapped turbine blades and vanes continued to be recycled hydrometallurgically to produce rhenium metal for use in new superalloy melts. The scrapped parts also were processed to generate engine revert—a high-quality, lower cost superalloy meltstock—by an increasing number of companies, mainly in Canada, Estonia, France, Germany, Japan, Poland, Russia, and the United States. Rhenium-containing catalysts also were recycled. The rhenium recycled from spent catalysts was either returned to the oil companies or to the catalyst producer for production of new catalysts in what is considered a closed-loop system.

Import Sources (2021–24): Ammonium perrhenate: Canada, 25%; Kazakhstan, 24%; Poland, 20%; Chile, 17%; and other, 14%. Rhenium metal: Chile, 38%; Canada, 28%; Germany, 21%; Poland, 11%; and other, 2%. Total imports: Chile, 31%; Canada, 27%; Germany, 16%; Poland, 14%; and other, 12%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Salts of peroxometallic acids, other, ammonium perrhenate	2841.90.2000	3.1% ad valorem.
Rhenium, unwrought, waste and scrap	8112.41.1000	Free.
Rhenium, unwrought, powders	8112.41.5000	3% ad valorem.
Rhenium, other	8112.49.0000	4% ad valorem.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: In 2025, the estimated price for catalytic-grade APR averaged $2,300 per kilogram, 78% more than the annual average price in 2024. The estimated rhenium metal pellet price averaged $2,600 per kilogram in 2025, a 90% increase from the annual average price in 2024. During 2025, the United States continued to rely on imports for much of its supply of rhenium. Canada, Chile, Germany, Kazakhstan, and Poland supplied most of the imported rhenium. Estimated imports of APR increased by 5% in 2025 compared with those in 2024. Estimated imports of unwrought rhenium and rhenium powders increased by 83% in 2025 compared with those in 2024. Estimated apparent consumption in 2025 increased by 34% compared with that in 2024.

Estimated world rhenium production in 2025 increased by 1% to 81,000 kilograms compared with 79,800 kilograms in 2024. The United States and Germany remained the leading producers of secondary rhenium, with additional production in Canada, Estonia, France, Japan, Poland, and Russia. Available data were insufficient to estimate U.S. output.

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RHENIUM

Industry sources estimated global secondary production to be between 20,000 and 25,000 kilograms in 2025, excluding rhenium recovered from spent catalysts, which was retained in a closed-loop system and reused to manufacture new catalysts. Several molybdenum-rhenium medical devices were approved by the U.S. Food and Drug Administration, highlighting the growing importance of medical implants as an end use for rhenium alongside aerospace and petroleum-reforming catalysts. As rhenium prices increased, recycling of rhenium-bearing superalloys was expected to become more financially attractive. However, industry sources indicated that recyclers would require prices to remain consistently above $3,000 per kilogram to offset high processing costs. In response, some companies increased investment in hydrometallurgical technologies to improve recovery from superalloy scrap.

On November 7, 2025, the U.S. Final 2025 List of Critical Minerals was published in the Federal Register (90 FR 50494). The changes in the 2025 list from the prior list published in 2022 (87 FR 10381) were the addition of copper, lead, potash, rhenium, silicon, and silver, based on the U.S. Geological Survey updated methodology for the 2025 list. As required by the Energy Act, public comment and interagency input were requested in response to the draft U.S. list of critical minerals published in the Federal Register (90 FR 41591). Based on that input, boron, metallurgical coal, phosphate rock, and uranium were also added.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for China, Kazakhstan, and Uzbekistan based on company and Government reports. Reserves data for China were revised based on company and Government reports.

	Mine production[e, 7]		Reserves[8]
	2024	2025	
United States	9,310	9,800	400,000
Armenia	200	200	95,000
Chile[9]	29,000	30,000	1,300,000
China	20,000	20,000	200,000
Kazakhstan	1,500	1,000	190,000
Korea, Republic of	3,000	3,000	NA
Poland	9,400	10,000	NA
Russia	NA	NA	310,000
Uzbekistan	7,400	7,000	NA
World total (rounded)	79,800	81,000	Large

World Resources:[8] Most rhenium occurs with molybdenum in porphyry copper deposits. Identified U.S. resources are estimated to be about 7 million kilograms. Rhenium also is associated with copper minerals in sedimentary deposits in Armenia, Kazakhstan, Poland, Russia, and Uzbekistan, where ore is processed for copper recovery and the rhenium-bearing residues are recovered at copper smelters.

Substitutes: Substitutes for rhenium in platinum-rhenium catalysts are continually being evaluated; one such application using iridium and tin has achieved commercial success. Other metals being evaluated for catalytic use include gallium, germanium, indium, selenium, silicon, tungsten, and vanadium. The use of these and other metals in bimetallic catalysts might decrease rhenium's share of the existing catalyst market; however, this would likely be offset by rhenium-bearing catalysts being considered for use in several proposed gas-to-liquid projects. Materials that can substitute for rhenium in various end uses are as follows: cobalt and tungsten for coatings on copper X-ray targets, rhodium and rhodium-iridium for high-temperature thermocouples, tungsten and platinum-ruthenium for coatings on electrical contacts, and tungsten and tantalum for electron emitters.

[e]Estimated. NA Not available. — Zero.

[1]Based on 80% recovery of estimated rhenium contained in molybdenum disulfide concentrates. Secondary rhenium production not included.

[2]Includes data for the following Harmonized Tariff Schedule of the United States (HTS) codes: 8112.41.1000, 8112.92.5000 (2021) and 8112.41.5000 and 8112.49.0000 (2022–25). Does not include wrought forms.

[3]The rhenium content of ammonium perrhenate is 69.42%.

[4]Defined as production + imports – exports.

[5]Average price per kilogram of rhenium in pellets (99.9% rhenium content) or catalytic-grade ammonium perrhenate (69.4% rhenium content). Source: Argus Media group, Argus Non-Ferrous Markets.

[6]Defined as imports – exports.

[7]Estimated amount of rhenium recovered in association with copper and molybdenum production. Secondary rhenium production not included.

[8]See Appendix C for resource and reserve definitions and information concerning data sources.

[9]Estimated rhenium recovered from roaster residues from Belgium, Chile, Mexico, and Peru.

RUBIDIUM

(Data in metric tons, rubidium oxide, unless otherwise specified)

Domestic Production and Use: In 2025, no rubidium was mined in the United States; however, occurrences of rubidium-bearing minerals are known in Alaska, Arizona, Idaho, Maine, South Dakota, and Utah. Rubidium is also associated with some evaporate mineral occurrences in other States. Rubidium is not a major constituent of any mineral. Rubidium concentrate is produced as a byproduct of pollucite (cesium) and lepidolite (lithium) mining and is imported from other countries for processing in the United States.

Applications for rubidium and its compounds include biomedical research, electronics, pyrotechnics, and specialty glass. Specialty glasses are the leading market for rubidium; rubidium carbonate may be used to reduce electrical conductivity, which improves stability and durability in fiber-optic telecommunications networks. Biomedical applications may include rubidium salts used in antishock agents and the treatment of epilepsy and thyroid disorder; rubidium-82, a radioactive isotope, may be used as a blood-flow tracer in positron emission tomographic imaging; and rubidium chloride may be used as an antidepressant.

Rubidium's photoemissive properties make it useful for electrical-signal generators in magnetometers, motion-sensor devices, night-vision devices, photoelectric cells (solar panels), photomultiplier tubes, and spectrometers. For industrial uses, rubidium is widely used as a catalyst in ammonia synthesis, hydrogenation, oxidation and polymerization reactions, and sulfuric acid synthesis. Rubidium may be used as an atomic resonance-frequency-reference oscillator for telecommunications network synchronization, playing a vital role in global positioning systems. Rubidium-rich feldspars may be used in ceramic applications for spark plugs and electrical insulators because of their high dielectric constant. Rubidium hydroxide may be used in fireworks to oxidize mixtures of other elements and produce violet hues. The U.S. military frequency standard, the United States Naval Observatory (USNO) timescale, is based on a network of weighted atomic clocks, including six USNO rubidium fountain clocks.

Rubidium atoms are used in academic research, including the development of quantum-mechanics-based computing devices, a future application with potential for relatively high consumption of rubidium. Quantum computing, which uses ultracold rubidium atoms in a variety of applications in research, would perform more complex computational tasks than traditional computers by calculating in two quantum states simultaneously. Research suggests that rubidium may be used in chemical storage within hydrogen batteries, ion propulsion engines, magnetohydrodynamic power generation, and thermionic power conversion.

Salient Statistics—United States: Consumption, export, and import data were not available. Some concentrate was imported to the United States in prior years for further processing. Industry information during the past decade suggests a domestic consumption rate of less than 2,000 kilograms of rubidium per year consumed in end-use products. The United States was 100% import reliant for rubidium minerals.

At the end of September 2025, one company offered 1-gram ampoules of 99.75% (metal basis) rubidium for $138.00, an 8% increase from $128.00 in 2024, and 100-gram ampoules of the same material for $2,453, a 7% increase from $2,290.00 in 2024. The price in 2025 for 10-gram ampoules of 99.8% (metal basis) rubidium formate hydrate was $301.00, compared with $302.00 in 2024.

In 2025, the prices for 10 grams of 99.8% (metal basis) rubidium acetate, rubidium bromide, rubidium carbonate, rubidium chloride, and rubidium nitrate were $72.10, $104.40, $71.70, $90.10, and $67.10, respectively, with increases ranging from 5% to 8% compared with prices in 2024.

The price for a rubidium-plasma standard solution (10,000 micrograms per milliliter) was $77.50 for 50 milliliters and $130.00 for 100 milliliters, an increase of 14% and 9%, respectively, from those in 2024.

Recycling: None.

Import Sources (2021–24): No reliable data have been available to determine the source of rubidium ore or compounds imported by the United States since 1988. The United States was 100% net import reliant for its rubidium needs and the primary global producers, including refined rubidium compounds, were estimated to include China, Germany, and Russia.

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RUBIDIUM

Tariff:

Item	Number	Normal Trade Relations 12–31–25
Alkali metals, other	2805.19.9000	5.5% ad valorem.
Chlorides, other	2827.39.9000	3.7% ad valorem.
Bromides, other	2827.59.5100	3.6% ad valorem.
Iodides, other	2827.60.5100	4.2% ad valorem.
Sulfates, other	2833.29.5100	3.7% ad valorem.
Nitrates, other	2834.29.5100	3.5% ad valorem.
Carbonates, other	2836.99.5000	3.7% ad valorem.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Domestic rubidium occurrences will remain subeconomic unless market conditions change, such as the development of new end uses or increased consumption for existing end uses, which in turn could lead to increased prices. No known human health issues are associated with exposure to naturally occurring rubidium, and its use has minimal environmental impact.

During 2025, no rubidium production was reported globally. Known production of rubidium ore from all countries ceased within the past two decades. Mining of rubidium in Namibia ceased in the early 2000s. The Bikita Mine in Zimbabwe was depleted of pollucite ore reserves in 2018. The Sinclair Mine in Australia completed the mining and shipments of all economically recoverable pollucite ore in 2019. Reports indicated that with current processing rates, the world's commercial stockpiles of rubidium ore may be depleted in the near future without additional future mineral extraction. Refined rubidium compounds were believed to be processed in China and Germany from existing stockpiles.

Throughout 2025, multiple projects that could produce rubidium as a byproduct of lepidolite, pollucite, spodumene, or zinnwaldite mining, focused primarily on lithium or cesium extraction, were in the exploration and feasibility stages. One company that was developing a lepidolite mine and processing facility in Namibia brought in an independent administrator owing to the lack of project financing at the end of 2024. Another company was in the process of securing financing to take ownership of the project as of September 2025. Based on historical information, the Namibia project contained a Joint Ore Reserves Committee (JORC)-compliant measured and indicated mineral resource estimate totaling 23,000 tons of rubidium.

In Australia, one company announced that initial testing of a rubidium extraction technology at the Mount Edon project in Western Australia yielded a 97% rubidium recovery rate. The Mount Edon project had an initial JORC-compliant inferred mineral resource estimate totaling 3.6 million tons, which contained an estimated 7,900 tons of rubidium oxide, and planned to secure funding to scale up the pilot plant in 2026 pending additional testing of the extraction technology.

World Mine Production and Reserves:[1] There were no official sources for rubidium production data in 2025. Lepidolite and pollucite, the principal rubidium-containing minerals in global rubidium reserves, can contain up to 3.5% and 1.5% rubidium oxide, respectively. Rubidium-bearing mineral resources are found in zoned pegmatites. Mineral resources exist globally, but extraction and concentration are mostly cost prohibitive. No reliable data were available to determine reserves for specific countries; however, Australia, Canada, China, and Namibia were estimated to have reserves totaling less than 200,000 tons of recoverable rubidium materials. Existing stockpiles at multiple former mine sites have continued feeding downstream refineries.

World Resources:[1] Significant rubidium-bearing pegmatite occurrences have been identified in Afghanistan, Australia, Canada, China, Denmark, Germany, Japan, Kazakhstan, Namibia, Peru, Russia, the United Kingdom, the United States, and Zambia. Minor quantities of rubidium are reported in brines in northern Chile and China and in evaporites in the United States (New Mexico and Utah), France, and Germany.

Substitutes: Rubidium and cesium can be used interchangeably in many applications because they have similar physical properties and atomic radii. Cesium, however, is more electropositive than rubidium, making it a preferred material for some applications.

[1]See Appendix C for resource and reserve definitions and information concerning data sources.

SALT

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: Domestic production of salt was an estimated 40 million tons in 2025. The quantity of salt sold or used in 2025 was an estimated 39 million tons with a total estimated value of $2.6 billion. Salt was produced by 25 companies that operated 60 plants in 15 States. The top producing States were Kansas, Louisiana, Michigan, New York, Ohio, Texas, and Utah. These seven States produced about 95% of the salt in the United States in 2025. The estimated percentage of salt sold or used was, by type, salt in brine, 44%; rock salt, 38%; solar salt, 9%; and vacuum pan salt, 9%.

The chemical industry accounted for about 42% of total salt sales, with salt in brine accounting for approximately 90% of the salt used for chemical feedstock. Chlorine and caustic soda manufacturers were the main consumers within the chemical industry. Highway deicing accounted for about 37% of total salt consumed. Other applications for salt included agricultural use, distributors, food processing, general industrial, miscellaneous uses, and primary water treatment.

Salient Statistics—United States:[1]	2021	2022	2023	2024	2025[e]
Production	39,300	39,400	40,000	40,400	40,000
Sold or used by producers	39,800	40,600	39,800	39,400	39,000
Imports for consumption	24,600	22,500	15,700	13,900	19,000
Exports	1,010	886	2,260	2,060	1,500
Consumption:					
Apparent[2]	63,400	62,300	53,200	51,300	57,000
Reported	47,100	45,300	44,100	42,300	43,000
Price, average unit value of bulk, pellets and packaged salt, free on board (f.o.b.) mine and plant, dollars per metric ton:					
Vacuum and open pan salt	203.72	217.58	238.51	259.69	260
Solar salt	153.52	128.87	142.80	152.87	150
Rock salt	59.88	56.86	52.28	52.95	54
Salt in brine	8.14	9.11	10.20	10.56	11
Employment, mine and plant, number[e]	4,000	4,100	4,100	4,100	4,000
Net import reliance[3] as a percentage of apparent consumption	37	35	25	23	31

Recycling: None.

Import Sources (2021–24): Mexico, 26%; Chile, 23%; Canada, 21%; Egypt, 6%; and other, 24%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Salt (sodium chloride)	2501.00.0000	Free.

Depletion Allowance: 10% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Salt consumption in 2025 increased relative to recent years, primarily owing to demand for road salt and the chloralkali markets. For much of the 2024–25 winter season, temperatures fluctuated around average, with January and February marked by widespread cold outbreaks throughout the continental United States. Precipitation was generally below average across many regions, yielding below-average snowfall totals in the traditional U.S. snowbelt. However, in mid-January, an arctic outbreak drove freezing precipitation deep into the south, with record snow in parts of Florida and Louisiana. Additionally, more frequent, smaller storms took place. The number of winter weather events including freezing rain, sleet, and snow is a better predictor of demand for rock salt than total snowfall. Several low snowfall or icing events usually require more salt for highway deicing than a single large event. A regional rock salt shortage affected New York in early 2025, owing to surging demand from severe weather and limited supply. Rock salt imports in 2025 were estimated to have increased compared with those in 2024 because consumption by many local and State transportation departments increased from that in 2024.

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SALT

For the 2025–26 winter, the National Oceanic and Atmospheric Administration (NOAA) predicted a weak La Niña weather pattern. This historically favors storm tracks along the northern United States and a warmer-than-average temperature pattern in the southern tier of the continental United States. NOAA forecasted drier-than-average conditions for the Gulf Coast, the Southeast, and the Southwest but wetter-than-average conditions across the Great Lakes and Northwest regions of the United States. Much of the Great Plains, the Middle Atlantic, and the Northeast are expected to experience average precipitation amounts with a slight chance of warmer-than-average conditions. These forecasts indicate that demand for rock salt could increase slightly compared with that in previous season in some locales in the United States.

Demand for salt brine used in the chloralkali industry globally was expected to increase in 2026 as demand for caustic soda and polyvinyl chloride increases globally, especially in Asia. However, domestic demand was anticipated to remain largely flat. Salt exports from Australia and India have increased in recent years to meet the increasing demand. However, demand for salt in the European market was expected to decline owing to closures of chloralkali capacity driven by high energy costs and weakening demand across the European chemical industry.

World Production and Reserves: Significant revisions were made to the 2024 production for Chile, India, Iran, Italy, Mexico, and Poland based on company and Government reports.

	Mine production[e]		Reserves[4]
	2024	**2025**	
United States[1]	[5]40,400	40,000	Large. Economic and subeconomic deposits of salt are substantial in principal salt-producing countries. The oceans contain a virtually inexhaustible supply of salt.
Australia	12,000	12,000	
Belarus	2,000	2,000	
Brazil	6,600	6,600	
Bulgaria	2,600	2,700	
Canada	[5]10,600	13,000	
Chile	8,900	9,000	
China	56,000	56,000	
Egypt	2,300	2,300	
France	4,500	4,500	
Germany	15,000	15,000	
India	34,000	30,000	
Iran	4,200	4,200	
Italy	3,000	1,900	
Mexico	7,000	7,000	
Netherlands	5,800	5,400	
Pakistan	3,100	3,100	
Poland	3,400	4,100	
Russia	6,900	7,000	
Saudi Arabia	2,400	2,400	
Spain	4,000	4,000	
Turkey	8,400	8,300	
United Kingdom	2,600	2,600	
Other countries	29,000	28,000	
World total (rounded)	275,000	270,000	

World Resources:[4] World continental resources of salt are vast, and the salt content in the oceans is nearly unlimited. Domestic resources of rock salt and salt from brine are primarily in Kansas, Louisiana, Michigan, New York, Ohio, and Texas. Saline lakes and solar evaporation salt facilities are in Arizona, California, Nevada, New Mexico, Oklahoma, and Utah. Almost every country in the world has salt deposits or solar evaporation operations of various sizes.

Substitutes: For most applications, no economic substitutes or alternatives exist for salt. Calcium chloride and calcium magnesium acetate, hydrochloric acid, and potassium chloride can be substituted for salt in deicing, certain chemical processes, and food flavoring, but at a higher cost.

[e]Estimated.
[1]Excludes production from Puerto Rico.
[2]Defined as sold or used by producers + imports – exports.
[3]Defined as imports – exports.
[4]See Appendix C for resource and reserve definitions and information concerning data sources.
[5]Reported.

SAND AND GRAVEL (CONSTRUCTION)[1]

(Data in million metric tons unless otherwise specified)

Domestic Production and Use: In 2025, an estimated 870 million tons of construction sand and gravel valued at $12.6 billion was produced by an estimated 3,400 companies operating 6,500 pits and more than 200 sales and (or) distribution yards in 50 States. Leading producing States were, in decreasing order of tonnage, Texas, California, Arizona, Minnesota, Michigan, Utah, Washington, Colorado, New York, and Wisconsin, which together accounted for about 54% of total output. An estimated 42% of construction sand and gravel was used as portland cement concrete aggregates, 20% for road base and coverings, 12% for construction fill, and 9% for asphaltic concrete aggregate and for other bituminous mixtures. The remaining amount was used for concrete products, drainage and rip rap, filtration, golf course maintenance, landscaping, masonry sand, pea gravel, pipe bending, plaster and gunite sands, railroad ballast, road stabilization, roofing granules, snow and ice control, and other miscellaneous uses.

The estimated output of construction sand and gravel in the United States shipped for consumption in the first 9 months of 2025 decreased to 657 million tons from 673 million tons in the same period in 2024. Third-quarter shipments for consumption increased slightly compared with those in the same period in 2024. Additional production information, by quarter, for each State, geographic division, and the United States is reported by the U.S. Geological Survey in its quarterly Mineral Industry Surveys for construction sand and gravel and crushed stone.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Sold or used by producers	939	959	967	[e]880	870
Imports for consumption	5	4	5	4	4
Exports	([2])	([2])	([2])	([2])	([2])
Consumption, apparent[3]	943	963	972	[e]890	870
Price, average unit value, dollars per metric ton	10.52	11.35	12.54	[e]13.90	14.50
Employment, mine and mill, number[4]	37,800	39,100	40,100	40,000	41,900
Net import reliance[5] as a percentage of apparent consumption	([2])	([2])	([2])	([2])	1

Recycling: Road surfaces made of asphalt concrete and portland cement concrete surface layers, which contain sand and gravel aggregate, were recycled on a limited but increasing basis in most States. In 2025, asphalt and portland cement concrete road surfaces were recycled in all 50 States.

Import Sources (2021–24): Canada, 90%; Mexico, 6%; and other, 4%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Sand, other	2505.90.0000	Free.
Pebbles and gravel	2517.10.0015	Free.

Depletion Allowance: Common varieties, 5% (domestic and foreign).

Government Stockpile: None.

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SAND AND GRAVEL (CONSTRUCTION)

Events, Trends, and Issues: U.S. construction sand and gravel production was about 870 million tons in 2025 compared with 880 million tons in 2024. Apparent consumption also decreased to 870 million tons. Commercial and heavy-industrial construction activity, infrastructure funding, labor availability, new single-family housing unit starts, and weather often affect growth in construction sand and gravel production and consumption. Long-term increases in construction aggregates demand are influenced by activity in the public and private construction sectors, as well as by construction work related to infrastructure improvements around the Nation. In 2026, major capital investments in manufacturing, energy, and data-center facilities, coupled with Federal and State infrastructure funding and resilient public-sector construction activity, were expected to support continued demand across the sector.

The 2021 Infrastructure Investment and Jobs Act reauthorized surface transportation programs for 5 years and authorized investment of additional funding to repair roads and bridges and support major, transformational projects. The 2021 law authorized $55.7 billion in fiscal year (FY) 2025 and $56.8 billion in FY 2026 for Federal-Aid Highway Programs. Funding will expire at the end of FY 2026. The 2021 law also included $118 billion to the Highway Trust Fund, with $59.8 billion remaining in the highway account and $20.2 billion remaining in the mass transit account. During the first 8 months of 2025, total highway construction spending was 25% less than that in the same period in 2024.

The underlying factors that support an increase in prices for construction sand and gravel were expected in 2026, especially in and near metropolitan areas. Shortages in some urban and industrialized areas were anticipated to continue to increase owing to local zoning regulations and land-development alternatives. These issues were likely to continue, resulting in new construction sand and gravel pits to be located away from large population centers. Resultant regional shortages of construction sand and gravel and higher fuel costs could result in higher-than-average price increases in industrialized and urban areas.

The construction sand and gravel industry continued to address health and safety regulations, permitting and zoning issues, and environmental restrictions in 2025.

World Mine Production and Reserves:

	Mine production[e]		Reserves[6]
	2024	2025	
United States	880	870	Reserves are controlled largely by land use and (or) environmental concerns.
Other countries[7]	NA	NA	
World total	NA	NA	

World Resources:[6] Sand and gravel resources are plentiful throughout the world. However, because of environmental regulations, geographic distribution, and quality requirements for some uses, sand and gravel extraction is uneconomical in some cases. The most important commercial sources of sand and gravel have been glacial deposits, river channels, and river flood plains. Use of offshore deposits in the United States is mostly restricted to beach erosion control and replenishment. Other countries routinely mine offshore deposits of aggregates for onshore construction projects.

Substitutes: Crushed stone, the other major construction aggregate, is often substituted for natural sand and gravel, especially in more densely populated areas of the Eastern United States. Crushed stone remains the dominant choice for construction aggregate use. Increasingly, recycled asphalt and portland cement concretes are used as substituted for virgin aggregate. The percentage of total aggregate supplied by recycled materials remained very small in 2025.

[e]Estimated. NA Not available.
[1]See also the Sand and Gravel (Industrial) and the Stone (Crushed) chapters.
[2]Less than ½ unit.
[3]Defined as sold or used by producers + imports – exports.
[4]Including office staff. Source: Mine Safety and Health Administration.
[5]Defined as imports – exports.
[6]See Appendix C for resource and reserve definitions and information concerning data sources.
[7]No reliable production information is available for most countries owing to the wide variety of ways in which countries report their sand and gravel production. Some countries do not report production for this mineral commodity. Production information for some countries is available in the U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International.

SAND AND GRAVEL (INDUSTRIAL)[1]

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: In 2025, industrial sand and gravel sold or used was an estimated 120 million tons valued at an estimated $4.5 billion. The quantity of industrial sand and gravel sold or used decreased by 5%, and the value decreased by 16% compared with that in 2024. Industrial sand and gravel was produced by 131 companies from 207 operations in 38 States. The leading producing States were, in descending order of production, Texas, Wisconsin, Oklahoma, and Louisiana. Combined production from these States accounted for 77% of total domestic sales and use. Approximately 81% of the U.S. tonnage was used as hydraulic-fracturing sand (frac sand) and well-packing and cementing sand, and 7% as glassmaking sand. Other common uses were, in decreasing quantity of use, fillers, foundry sand, filtration sand and gravel, and recreational sand, which accounted for 7% combined. Other minor uses were, in decreasing quantity of use, chemicals, abrasives, silicon and ferrosilicon, ceramics, traction sand, and metallurgical sand, which accounted for 1% combined. Other unspecified uses accounted for 4% combined.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Sold or used	91,200	121,000	136,000	131,000	120,000
Imports for consumption	350	338	211	272	210
Exports[2]	5,350	6,290	7,050	7,700	8,000
Consumption, apparent[3]	86,200	115,000	129,000	123,000	120,000
Price, average value, dollars per metric ton	40.80	45.40	42.90	40.90	36
Employment, quarry and mill, number[e]	5,300	6,000	6,100	6,200	6,200
Net import reliance[4] as a percentage of apparent consumption	E	E	E	E	E

Recycling: Recycled cullet (pieces of glass) represents a significant proportion of reused silica. About 33% of glass containers are recycled. Some abrasive and foundry sands are recycled or reclaimed.

Import Sources (2021–24): Canada, 84%; Vietnam, 5%; Republic of Korea, 4%; Taiwan, 3%; and other, 4%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Sand containing 95% or more silica and not more than 0.6% iron oxide	2505.10.1000	Free.

Depletion Allowance: Common varieties, 5% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: The most important driving force in the industrial sand and gravel industry remained the production and sale of frac sand. U.S. apparent consumption of industrial sand and gravel was estimated to be 120 million tons in 2025, a 6% decrease from that in 2024. An oversupply of frac sand led to lower prices, which caused some operations to decrease production or idle operations. Imports of industrial sand and gravel in 2025 were an estimated 210,000 tons, a 22% decrease from those in 2024. U.S. exports of industrial sand and gravel were an estimated 8 million tons, a 4% increase from those in 2024. The United States remained a net exporter of industrial sand and gravel.

Onshore rig counts for oil and gas production are often used as an indicator of frac sand consumption. However, frac sand used per well has increased in recent years owing to an increase of both the average length of wells and proppant intensity (proppant per meter of lateral length). In the first 10 months of 2025, the average active onshore rig count[5] was 549, a 6% decrease compared with the average onshore active rig count of 582 during the same period in 2024. The active onshore rig count[5] at the end of October 2025 was 525, an 8% decrease compared with the active onshore rig count of 573 at the beginning of 2025.

The industrial sand and gravel industry continued to be concerned with safety and health regulations and environmental restrictions in 2025, especially those concerning crystalline silica exposure. Local shortages of industrial sand and gravel were expected to persist owing to land development priorities, local zoning regulations, and logistical issues. Increased efforts to reduce cost, emissions, and the risk of exposure to crystalline silica have led to an increase of in-basin “dry sand” and undried “wet sand” being sold or used as frac sand instead of conventional “dry sand” from out-of-basin sources. In 2025, petroleum coke-based lightweight proppant increased in use as a substitute for frac sand, driven by its lower cost and potential to improve well recovery.

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SAND AND GRAVEL (INDUSTRIAL)

On July 1, 2025, Texas, which was the leading producing state of industrial sand and gravel in 2025, began treating frac sand as a taxable processed material, ending its long-standing sales tax exemption.

In 2025, multiple companies that produced industrial sand and gravel were acquired by or merged with other companies.

The United States was the world's leading producer and consumer of industrial sand and gravel based on estimated world production figures. Collecting definitive data on industrial sand and gravel production for most nations is difficult because of the wide range of terminology and specifications used by different countries. The United States remained a major exporter of industrial sand and gravel, shipping it to almost every region of the world.

World Mine Production and Reserves: Production in 2024 for Italy was revised significantly based on country reports.

	Mine production[e]		Reserves[6]
	2024	2025	
United States	[7]131,000	120,000	Large. Industrial sand and gravel deposits are widespread.
Argentina	4,300	4,500	
Australia	5,500	5,600	
Bulgaria	8,770	8,800	
Canada	3,800	3,800	
China	91,000	92,000	
France	[7]12,600	13,000	
Germany	9,170	9,200	
India	11,900	12,000	
Indonesia	3,540	3,500	
Italy	[7]13,500	13,000	
Malaysia	6,000	6,000	
Mexico	2,700	2,700	
Netherlands	68,000	68,000	
Poland	5,900	5,900	
Russia	7,300	7,300	
Saudi Arabia	2,100	2,100	
Spain	6,330	6,300	
Turkey	[7]13,700	14,000	
United Kingdom	4,700	4,700	
Other countries	22,700	23,000	
World total (rounded)	434,000	430,000	

World Resources:[6] Sand and gravel resources of the world are large. However, because of their geographic distribution, environmental restrictions, and quality requirements for some uses, extraction of these resources is sometimes uneconomical. Quartz-rich sand and sandstone, the main sources of industrial silica sand, occur throughout the world.

Substitutes: Alternative materials that can be used for glassmaking, foundry, and molding sands are chromite, olivine, staurolite, and zircon sands. Alternative materials that can be used for abrasive sands are garnet, olivine, and slags. Although costlier and mostly used in deeper wells, alternative materials that can be used as proppants are sintered bauxite and kaolin-based ceramic proppants. Petroleum coke can be used as proppants, situationally offering lower costs and enhanced recovery.

[e]Estimated. E Net exporter.
[1]See also the Sand and Gravel (Construction) chapter.
[2]Modified from the previous Mineral Commodity Summaries to only include data for the following Schedule B number: 2505.10.0000.
[3]Defined as production (sold or used) + imports – exports.
[4]Defined as imports – exports.
[5]Source: Baker Hughes Co., 2025, North American rig count report—New report: Baker Hughes Co. (Accessed November 25, 2025, at https://rigcount.bakerhughes.com/na-rig-count.)
[6]See Appendix C for resource and reserve definitions and information concerning data sources.
[7]Reported.

SCANDIUM[1]

(Data in metric tons, scandium oxide equivalent, unless otherwise specified)

Domestic Production and Use: Domestically, scandium was not commercially mined or recovered in 2025. The United States had small-scale scandium-metal refining capacity in Ames, IA, and Tolleson, AZ; additional capacity was under development in Urbana, IL, and at the Elk Creek project in Nebraska. The principal uses for scandium in 2025 were in aerospace alloys and solid oxide fuel cells used in large-scale power generation and backup power systems for critical infrastructure. Other minor uses for scandium included electronics and alloys for military equipment and sporting goods.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Imports, scandium oxide:[e, 2]	1	6	6	7	4
Price, global, dollars per kilogram, range of average values:					
Scandium oxide, powder, 99.99% purity, 5- to 100-kilogram lot size:[3]	890–1,000	820–880	700–740	660–670	640
Scandium metal, ingot, 99.999% purity, 1- to 10-kilogram lot size:[3, 4]	5,300	5,400	5,500	5,200	5,200
Scandium-aluminum alloy, ingot, scandium 2%, 1- to 30-kilogram lot size:[3, 4]	42	40	37	34	30
Net import reliance[5] as a percentage of apparent consumption	100	100	100	100	100

Recycling: None.

Import Sources (2021–24): Although there are no domestic trade codes for scandium materials exclusively, shipping records indicated scandium oxide was imported from Japan,[6] 89%; and China, 11%. Import sources do not include scandium contained in value-added intermediates and finished products.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Rare-earth metals:		
Unspecified, not alloys	2805.30.0050	5% ad valorem.
Unspecified, alloyed	2805.30.0090	5% ad valorem.
Compounds of rare-earth metals:		
Mixtures of oxides of yttrium or scandium as the predominant metal	2846.90.2015	Free.
Mixtures of chlorides of yttrium or scandium as the predominant metal	2846.90.2082	Free.
Mixtures of other rare-earth carbonates, including scandium	2846.90.8075	3.7% ad valorem.
Mixtures of other rare-earth compounds, including scandium	2846.90.8090	3.7% ad valorem.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

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SCANDIUM

Events, Trends, and Issues: The U.S. Geological Survey estimated that global consumption of scandium oxide in 2025 was 60 tons, and that the primary global uses were aerospace alloys, other alloys, and solid oxide fuel cells.

In April, China tightened its export controls on rare earth elements, adding specific controls on scandium metal, alloys, oxides, and compounds. In November, the United States stated that China will issue general licenses for rare-earth exports, effectively eliminating the controls introduced in April. As of December 2025, the April export controls remained in effect, although China began to issue general export licenses to selected exporters.

In August, a company was awarded $10 million from the U.S. Department of War (DOW) to develop a U.S. mine-to-master alloy supply chain near Elk Creek, NE. In November, another company was awarded $29.9 million from the DOW to develop a U.S. supply of scandium and gallium; part of this award was for the development of a demonstration facility to separate and purify scandium from existing industrial waste.

In September, the Defense Logistics Agency announced plans to procure more than 6,000 kilograms of scandium oxide for the National Defense Stockpile from a source in Sorel-Tracy, Quebec, Canada; this procurement would take place over a 5-year period with a minimum commitment of $2 million and a potential total value of as much as $40 million. In October, the Canada Growth Fund committed $18 million to the Sorel-Tracey operation to expand scandium oxide production capacity to 9 tons per year; this commitment was accompanied by an offtake agreement with the Government of Canada.

In October, the Australian Government granted a mining license to a company for its Nyngan scandium project in New South Wales, Australia.

World Mine Production and Reserves:[7] Scandium was produced exclusively as a byproduct, primarily from nickel and titanium process streams, as well as from previously processed tailings and residues. According to industry estimates, global capacity for scandium oxide was over 90 tons per year in 2025; global production totaled about 80 tons. China was the leading producer. Scandium materials were also produced in the Philippines and sent to Japan for further processing into scandium oxide. Australia's reserves (accessible Economic Demonstrated Resources) were about 34,000 tons of scandium as of December 2023.[8] Global reserves of scandium were not quantified.

World Resources:[7] Resources of scandium are abundant but rarely occur in high concentrations; as a result, economically recoverable scandium was produced mainly as a byproduct. Scandium resources have been identified in Australia, Canada, China, Finland, Guinea, Kazakhstan, Madagascar, Norway, the Philippines, Russia, South Africa, Ukraine, and the United States.

Substitutes: Titanium and aluminum high-strength alloys as well as carbon-fiber materials may substitute in high-performance scandium-alloy applications. In some applications that rely on scandium's unique properties, substitution is not possible.

[e]Estimated. NA Not available.
[1]See also the Rare Earths chapter. Scandium is one of the 17 rare-earth elements.
[2]Estimated from Trade Mining LLC shipping records.
[3]Ex-works China.
[4]Source: Asian Metal Ltd.
[5]Defined as imports – exports. Quantitative export data were not available.
[6]Imports reported as Philippine in origin were reassigned to Japan because the finished scandium oxide was refined in Japan from Philippine scandium-oxalate feedstocks. The Philippines did not export finished scandium oxide.
[7]See Appendix C for resource and reserve definitions and information concerning data sources.
[8]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 12,000 tons.

SELENIUM

(Data in metric tons, selenium content, unless otherwise specified)

Domestic Production and Use: Selenium is recovered principally as a byproduct of the electrolytic refining of primary copper, where it accumulates in the residues of copper anodes. In 2025, two primary electrolytic copper refineries operated in the United States, one in Texas and one in Utah, and produced crude selenium and selenium-bearing anode slimes. Selenium was not refined in the United States. Downstream companies processed imported selenium to manufacture high-purity selenium products, selenium dioxide, and other selenium compounds. Domestic selenium production, consumption, and stocks were withheld to avoid disclosing company proprietary data.

Selenium is used in agriculture as a fertilizer additive to increase plant tolerance to environmental stressors; in antidandruff shampoos as an active ingredient; in blasting caps to control delays; in catalysts to enhance selective oxidation; in copper, lead, and steel alloys to improve machinability; in the electrolytic production of manganese metal to increase yields; in glass manufacturing to decolorize the green tint caused by iron impurities in container glass and other soda-lime silica glass; in gun bluing to improve cosmetic appearance and provide corrosion resistance; in photocells and solar cells used in electronics for its photovoltaic and photoconductive properties; in pigments to produce orange and red colors; in plating solutions to improve appearance and durability; in rubber-compounding chemicals to act as a vulcanizing agent; and in thin-film copper-indium-gallium-diselenide (CIGS) solar cells. Selenium is also an essential micronutrient and is used as a dietary supplement for humans and livestock. In 2025, estimated end uses for selenium in global consumption were metallurgy (including electrolytic manganese metal production), 40%; agriculture and animal health, 20%; glass manufacturing, 20%; electronics and photovoltaics, 10%; chemicals and pigments, 5%; and other applications, 5%.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production, crude and anode slimes	W	W	W	W	W
Imports for consumption:					
Selenium	346	351	269	225	400
Selenium dioxide	71	10	8	5	9
Exports[1]	227	192	94	108	290
Consumption, apparent[2]	W	W	W	W	W
Price, annual average, dollars per kilogram:					
United States[3]	18.18	23.07	23.11	24.19	28
Europe[4]	18.47	19.82	19.30	24.86	29
Stocks, producer, yearend	W	W	W	W	W
Net import reliance[5] as a percentage of apparent consumption	>50	>50	>50	>50	>50

Recycling: Insignificant. Most scrap from electronic materials was exported for recovery of contained selenium.

Import Sources (2021–24): Selenium: Philippines, 25%; Mexico, 14%; Chile, 12%; Poland, 11%; and other, 38%. Selenium dioxide: Republic of Korea, 78%; China, 10%; Philippines, 7%; Germany, 4%; and other, 1%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Selenium	2804.90.0000	Free.
Selenium dioxide	2811.29.2000	Free.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: The supply of selenium is directly affected by the supply of materials from which it is a byproduct, primarily copper. In 2025, domestic production of crude selenium and selenium-bearing copper anode slimes was estimated to have decreased from that in 2024, reflecting lower output of copper cathodes from primary electrolytic refineries in the United States. Reported annual average prices for selenium increased in both U.S. and European warehouses. In the United States, the average price increased by 16% to an estimated $28 per kilogram in 2025 from $24.19 per kilogram in 2024. In Europe, the average price was an estimated $29 per kilogram in 2025, 17% greater than $24.86 per kilogram in 2024.

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SELENIUM

China was the leading producer of refined selenium in 2025 and accounted for 53% of estimated global production (excluding production in multiple countries for which available information was inadequate to make reliable estimates of output). Selenium production in China increased significantly over the past 10 years, corresponding with an increase of nearly 75% in the production capacity of electrolytically refined copper. The production capacity of copper anodes, the feedstock material for electrolytic copper refineries, more than doubled over the same time period. In January 2025, the first batch of refined selenium was shipped from a recently completed plant in Kazakhstan. The facility was expected to produce approximately 75 tons per year of selenium with a purity of 99.5%.

World Refinery Production and Capacity: Significant revisions were made to the 2024 production for Finland and India based on company and Government reports.

	Refinery production[e, 6]		Refinery capacity[e, 6]
	2024	2025	
United States (crude and anode slimes)	W	W	W
Belgium	200	200	[7]300
Canada	130	130	180
China	1,800	2,000	2,500
Finland	[7]38	39	170
Germany	49	47	60
India	88	90	100
Japan	730	640	800
Kazakhstan	2	50	100
Mexico	[7]78	88	190
Peru	[7]53	48	65
Poland	[7]68	67	90
Russia	310	320	350
Serbia	69	71	100
South Africa	11	10	15
Turkey	43	43	50
Uzbekistan	2	2	3
Other countries[8]	NA	NA	NA
World total (rounded)	[9]3,670	[9]3,800	5,100

World Resources:[10] Reserves and resources of selenium are generally not reported at the mine or country level and cannot be reliably quantified. More than 80% of selenium has been produced from anode slimes as a byproduct of primary electrolytic copper refining. Other potential sources of selenium include lead, nickel, and zinc ores. Coal generally contains significant quantities of selenium, but recovery of selenium from coal fly ash, although technically feasible, will likely not be economical in the foreseeable future.

Substitutes: Amorphous silicon and cadmium telluride are the two principal competitors with CIGS in thin-film photovoltaic cells. Organic pigments have been developed as substitutes for cadmium sulfoselenide pigments. Silicon is the major substitute for selenium in low- and medium-voltage rectifiers. Sulfur dioxide can be used as a replacement for selenium dioxide in the production of electrolytic manganese metal but is not as energy efficient. Other substitutes include bismuth, lead, and tellurium in free-machining alloys; bismuth and tellurium in lead-free brasses; cerium oxide as either a colorant or decolorant in glass; and tellurium in pigments and rubber.

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data.
[1]Includes Schedule B of the United States number 2804.90.0000 (selenium) only; there is no exclusive Schedule B number for selenium dioxide.
[2]Defined as production (selenium content of crude selenium and anode slimes) + imports (excluding selenium dioxide) – exports ± adjustments for industry stock changes.
[3]Minimum purity of 99.5%, free on board, U.S. warehouse. Source: Argus Media group, Argus Non-Ferrous Markets.
[4]Minimum purity of 99.5%, in warehouse, Rotterdam. Source: Argus Media group, Argus Non-Ferrous Markets.
[5]Defined as imports (excluding selenium dioxide) – exports ± adjustments for industry stock changes.
[6]Unless otherwise noted, data are for refined selenium only to the extent possible. Countries that produced selenium contained in copper ore and concentrate, copper smelter products (such as blister and anodes), copper refinery residues (such as anode slimes), and (or) other selenium-containing materials but did not recover refined selenium are excluded.
[7]Reported.
[8]In addition to the countries listed, Armenia, Australia, Chile, Iran, the Republic of Korea, the Philippines, Zambia, and Zimbabwe may have produced refined selenium, but available information was inadequate to make reliable estimates of output.
[9]Excludes U.S. production.
[10]See Appendix C for resource and reserve definitions and information concerning data sources.

SILICON

(Data in thousand metric tons, silicon content, unless otherwise specified)

Domestic Production and Use: Ferrosilicon and silicon metal were produced at five facilities in 2025, all east of the Mississippi River. Most ferrosilicon was consumed in the ferrous foundry and steel industries, predominantly in the Eastern United States, and was sourced primarily from domestic quartzite (silica). The main consumers of silicon metal were producers of aluminum alloys and the chemical industry, in particular for the manufacture of silicones. Silicon metal may be further processed into ultra-high-purity semiconductor- or solar-grades, commonly referred to as polysilicon. Three companies produced polysilicon in the United States; a fourth facility announced at the end of 2024 that it would cease polysilicon production owing to its unsuccessful attempts to meet the quality standards and volumes required by its customer.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production, ferrosilicon[1] and silicon metal[2]	W	W	W	W	W
Imports for consumption:					
Ferrosilicon, all grades	125	175	154	126	110
Silicon metal	97	116	79	117	180
Exports:					
Ferrosilicon, all grades	7	9	5	4	2
Silicon metal	53	47	42	40	30
Consumption, apparent,[3] ferrosilicon[1] and silicon metal[2]	W	W	W	W	W
Price, average, cents per pound of silicon:					
Ferrosilicon, 50% silicon[4]	137.94	NA	NA	NA	NA
Ferrosilicon, 75% silicon[5]	192.28	312.10	142.23	131.96	140
Silicon metal[2, 5]	220.31	361.86	179.69	170.34	130
Stocks, producer, ferrosilicon[1] and silicon metal,[2] yearend	11	17	15	W	W
Net import reliance[6] as a percentage of apparent consumption:					
Ferrosilicon, all grades	<50	>50	>50	<50	<50
Silicon metal[2]	<25	<50	<50	<50	>50
Total	<50	<50	<50	<50	>50

Recycling: Insignificant.

Import Sources (2021–24): Ferrosilicon: Russia, 30%; Brazil, 16%; Canada, 13%; Malaysia, 11%; and other, 30%. Silicon metal: Brazil, 38%; Canada, 29%; Norway, 12%; Australia, 6%; and other, 15%. Total: Brazil, 25%; Canada, 20%; Russia, 18%; Malaysia, 8%; and other, 29%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Silicon:		
More than or equal to 99.99% silicon	2804.61.0000	Free.
More than or equal to 99.00% but less than 99.99% silicon	2804.69.1000	5.3% ad valorem.
Other	2804.69.5000	5.5% ad valorem.
Ferrosilicon:		
More than 55% but less than or equal to 80% silicon:		
More than 3% calcium	7202.21.1000	1.1% ad valorem.
Other	7202.21.5000	1.5% ad valorem.
More than 80% but less than or equal to 90% silicon	7202.21.7500	1.9% ad valorem.
More than 90% silicon	7202.21.9000	5.8% ad valorem.
Other:		
More than 2% magnesium	7202.29.0010	Free.
Other	7202.29.0050	Free.

Depletion Allowance: Quartzite, 14% (domestic and foreign); gravel, 5% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Combined domestic ferrosilicon and silicon metal production in 2025 was withheld to avoid disclosing proprietary information but was estimated to be less than that in 2024. China accounted for almost 80% of total global estimated production of silicon materials in 2025. Global production of silicon materials, on a silicon-content basis, was estimated to have decreased compared with 2024 production. According to industry publications, the January through October 2025 average U.S. price for silicon metal was about 21% less than the

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SILICON

annual average price in 2024, and the average U.S. price for 75%-grade ferrosilicon was about 3% more than the annual average price in 2024. The decrease in the average price of silicon metal in 2025 was attributed to oversupply, weak demand from the aluminum and silicon industries, and the availability of polysilicon stocks. In April 2025, prices of silicon metal from China were the lowest since November 2016. In 2025, total silicon metal imports were estimated to be about 50% more than those in 2024. Uncertainty regarding tariffs and concerns over possible future export restrictions from other countries may have contributed to the increase in silicon metal imports.

In April, the U.S. International Trade Commission determined that a United States industry was materially injured by imports of ferrosilicon (subheadings 7202.21 and 7202.29 of the Harmonized Tariff Schedule of the United States) from Brazil, Kazakhstan, and Malaysia and issued countervailing and antidumping duty orders on imports of ferrosilicon from those countries. This followed the U.S. Department of Commerce's determination that ferrosilicon had been sold at less than fair value and was subsidized by the Governments of Brazil, Kazakhstan, and Malaysia.

On November 7, 2025, the U.S. Final 2025 List of Critical Minerals was published in the Federal Register (90 FR 50494). The changes in the 2025 list from the prior list published in 2022 (87 FR 10381) were the addition of copper, lead, potash, rhenium, silicon, and silver, based on the U.S. Geological Survey updated methodology for the 2025 list. As required by the Energy Act, public comment and interagency input were requested in response to the draft U.S. list of critical minerals published in the Federal Register (90 FR 41591). Based on that input, boron, metallurgical coal, phosphate rock, and uranium were also added.

World Production:

	Ferrosilicon[e]		Silicon metal[e]	
	2024	2025	2024	2025
United States	W	W	W	W
Australia	—	—	47	47
Bhutan	98	98	—	—
Brazil	160	170	190	180
Canada	23	23	34	34
China	3,100	3,500	4,800	4,000
France	21	21	90	68
Germany	—	—	29	13
Iceland	90	72	28	16
India	59	59	—	—
Kazakhstan	120	120	7	7
Malaysia	120	120	—	—
Norway	160	150	140	130
Russia	420	420	59	35
South Africa	36	35	15	10
Spain	41	40	6	4
Other countries	120	40	42	46
World total (rounded)	[7]4,600	[7]5,000	[7]5,500	[7]4,600

World Resources:[8] World and domestic resources for making silicon metal and alloys are abundant and, in most producing countries, adequate to supply world requirements for many decades. The source of the silicon is silica in various natural forms, such as quartzite.

Substitutes: Aluminum, silicon carbide, and silicomanganese can be substituted for ferrosilicon in some applications. Gallium arsenide and germanium are the principal substitutes for silicon in semiconductor and infrared applications.

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.
[1]Ferrosilicon grades include the two standard grades of ferrosilicon—50% silicon and 75% silicon—plus miscellaneous silicon alloys.
[2]Metallurgical-grade silicon metal.
[3]Defined as production + imports – exports ± adjustments for industry stock changes.
[4]Source: CRU Group, transaction prices based on weekly averages. Average spot prices for ferrosilicon, 50% grade, were discontinued in April 2022.
[5]Source: S&P Global Platts Metals Week, mean import prices based on monthly averages. Estimated 2025 price is the mean based on monthly average of January through October 2025.
[6]Defined as imports – exports ± adjustments for industry stock changes.
[7]Excludes U.S. production.
[8]See Appendix C for resource and reserve definitions and information concerning data sources.

SILVER

(Data in metric tons,[1] silver content, unless otherwise specified)

Domestic Production and Use: In 2025, U.S. mines produced approximately 1,100 tons of silver with an estimated value of $1.4 billion. Silver was produced at 4 silver mines and as a byproduct or coproduct from 31 domestic base- and precious-metal operations. Silver was produced in 12 States; Alaska continued as the country's leading silver-producing State, followed by Nevada. There were 24 U.S. refiners that reported production of commercial-grade silver with an estimated total output of 2,100 tons from domestic and foreign ores and concentrates and from new and old scrap. The physical properties of silver include high ductility, electrical conductivity, malleability, and reflectivity. In 2025, the estimated domestic uses for silver were in electrical and electronics, 25%; other industrial uses and photography, 19%; net physical investment (bars), 18%; photovoltaics (PV), 15%; coins and medals, 14%; jewelry and silverware, 6%; and brazing and solder, 3%. Other applications for silver include use in antimicrobial bandages, clothing, pharmaceuticals, and plastics; batteries; bearings; brazing and soldering; catalytic converters in automobiles; electroplating; inks; mirrors; photography; photovoltaic solar cells; water purification; wood treatment; and processing of spent ethylene oxide catalysts. Mercury and silver, the main components of dental amalgam, are biocides, and their use in amalgam inhibits recurrent decay.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production:					
Mine	1,020	1,010	1,020	1,050	1,100
Refinery:					
Primary	1,920	1,850	1,150	1,140	1,100
Secondary (new and old scrap)	908	1,090	1,150	955	1,000
Imports for consumption[2]	6,160	4,490	4,950	4,430	7,600
Exports[2]	137	276	73	113	300
Consumption, apparent[3]	7,950	6,310	7,070	6,320	9,400
Price, bullion, average, dollars per troy ounce[4]	25.23	21.88	23.54	28.37	38
Stocks, yearend:					
Industry	56	55	27	23	25
Treasury[5]	498	498	498	498	498
New York Commodities Exchange—COMEX	11,064	9,299	8,643	9,910	15,000
Employment, mine and mill, number[6]	1,265	1,304	1,422	1,485	1,300
Net import reliance[7] as a percentage of apparent consumption	76	67	69	68	77

Recycling: In 2025, approximately 1,000 tons of silver was recovered from new and old scrap, accounting for about 11% of apparent consumption.

Import Sources (2021–24):[2] Mexico, 47%; Canada, 18%; Chile and Turkey, 5% each; and other, 25%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Silver ores and concentrates	2616.10.0040	0.8 ¢/kg on lead content.
Bullion	7106.91.1010	Free.
Dore	7106.91.1020	Free.

Depletion Allowance: 15% (domestic), 14% (foreign).

Government Stockpile: The U.S. Department of the Treasury maintains stocks of silver (see salient statistics above).

Events, Trends, and Issues: The estimated average silver price in 2025 was $38 per troy ounce, 34% higher than the average price in 2024. The price began the year at $29.35 per troy ounce, which was the yearly low. The price increased for 11 months in 2025 and reached a high of $53.60 per troy ounce on November 13. The continued supply deficit was cited as a reason for price increases in 2025.

In 2025, global consumption of silver was an estimated 35,700 tons, compared with 36,100 tons in 2024. Coin and bar consumption increased by 7% in 2025, but consumption of silver for industrial use was estimated to be unchanged from that in 2024, owing to slower ethylene oxide capacity growth and a decline in silver loadings in the PV sector, which was expected to offset continued growth in automotive, consumer electronics, and power grid uses. Consumption of silver in jewelry and silverware was estimated to have decreased by 6% and 15%, respectively.[8]

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SILVER

World silver mine production increased slightly in 2025 to an estimated 26,000 tons compared with 25,300 tons in 2024. Domestic silver production was estimated to have increased by 4% in 2025. One company in Idaho produced from higher silver grade ore than that in 2024 and implemented operational improvements and efficiencies.

On November 7, 2025, the U.S. Final 2025 List of Critical Minerals was published in the Federal Register (90 FR 50494). The changes in the 2025 list from the prior list published in 2022 (87 FR 10381) were the addition of copper, lead, potash, rhenium, silicon, and silver, based on the U.S. Geological Survey updated methodology for the 2025 list. As required by the Energy Act, public comment and interagency input were requested in response to the draft U.S. list of critical minerals published in the Federal Register (90 FR 41591). Based on that input, boron, metallurgical coal, phosphate rock, and uranium were also added.

World Mine Production and Reserves: Reserves for Australia, Chile, China, Peru, and Poland were revised based on Government reports.

	Mine production		Reserves[9]
	2024	2025[e]	
United States	1,050	1,100	23,000
Argentina	774	800	6,500
Australia	1,050	1,000	[10]91,000
Bolivia	1,490	1,500	22,000
Canada	[e]366	400	4,900
Chile	[e]1,200	1,400	33,000
China	3,430	3,400	67,000
India	700	800	8,000
Kazakhstan	[e]850	630	NA
Mexico	5,780	6,300	37,000
Peru	3,510	3,600	110,000
Poland	1,320	1,300	59,000
Russia	1,280	1,200	92,000
Sweden	432	400	NA
Other countries	2,110	2,100	57,000
World total (rounded)	25,300	26,000	610,000

World Resources:[9] Although silver was a principal product at several mines, silver was primarily obtained as a byproduct from lead-zinc, copper, and gold mines, in descending order of silver production. The polymetallic ore deposits from which silver was recovered account for more than two-thirds of U.S. and world resources of silver. Most recent silver discoveries have been associated with gold occurrences; however, copper and lead-zinc occurrences that contain byproduct silver will continue to account for a significant share of reserves and resources in the future.

Substitutes: Digital imaging, film with reduced silver content, silverless black-and-white film, and xerography substitute for traditional photographic applications for silver. Surgical pins and plates may be made with stainless steel, tantalum, and titanium in place of silver. Stainless steel may be substituted for silver flatware. Nonsilver batteries may replace silver batteries in some applications. Aluminum and rhodium may be used to replace silver that was traditionally used in mirrors and other reflecting surfaces. Silver may be used to replace more costly metals in catalytic converters for off-road vehicles.

[e]Estimated. NA Not available.

[1]One metric ton (1,000 kilograms) = 32,150.7 troy ounces.

[2]Silver content of base metal ores and concentrates, ash and residues, refined bullion, and dore; excludes coinage and waste and scrap material.

[3]Defined as mine production + secondary production + imports – exports ± adjustments for Government and industry stock changes. Does not include investment purchases and sales.

[4]Engelhard's industrial bullion quotations. Source: S&P Global Platts Metals Week.

[5]Source: U.S. Mint. Balance in U.S. Mint only; includes deep storage and working stocks.

[6]Source: U.S. Department of Labor, Mine Safety and Health Administration (MSHA). Only includes mines where silver is the primary product.

[7]Defined as imports – exports ± adjustments for Government and industry stock changes.

[8]Source: Metals Focus, 2025, World silver survey 2025: Silver Institute, prepared by Metals Focus, 88 p. (Accessed November 17, 2025, at https://www.silverinstitute.org/wp-content/uploads/2025/04/World-Silver-Survey-2025.pdf.)

[9]See Appendix C for resource and reserve definitions and information concerning data sources.

[10]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 22,000 tons.

SODA ASH

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: The total value of domestic soda ash (sodium carbonate) produced in 2025 was an estimated $1.8 billion[1] and the quantity produced was an estimated 12 million tons, 3% more than that in 2024. The U.S. soda ash industry consisted of four companies in Wyoming operating five plants and one company in California operating one plant. The five producing companies have a combined nameplate capacity of 13.9 million tons per year (15.3 million short tons per year). Borax, salt, and sodium sulfate were produced as coproducts of sodium carbonate production in California. Chemical caustic soda, sodium bicarbonate, and sodium sulfite were manufactured as coproducts at several of the Wyoming soda ash plants. Sodium bicarbonate was produced at an operation in Colorado using soda ash feedstock shipped from the company's Wyoming facility.

Based on 2025 quarterly reports, the estimated distribution of soda ash by end use was glass, 45%; chemicals, 28%; miscellaneous uses, 9%; distributors, 7%; soap and detergents, 5%; flue gas desulfurization, 4%; pulp and paper, 1%; and water treatment, 1%.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production[2]	11,300	11,300	10,900	11,700	12,000
Imports for consumption	115	61	45	71	35
Exports	6,840	6,470	6,660	7,400	6,900
Consumption:					
Apparent[3]	4,550	4,760	4,360	4,350	4,700
Reported	4,640	4,640	4,460	4,350	4,300
Price, average unit value of sales (natural source), free on board (f.o.b.) mine or plant:					
Dollars per metric ton	133.37	178.52	211.48	169.35	150
Dollars per short ton	120.99	161.95	191.85	153.63	140
Stocks, producer, yearend	278	364	251	245	300
Employment, mine and plant, number[e]	2,400	2,400	2,400	2,400	2,400
Net import reliance[4] as a percentage of apparent consumption	E	E	E	E	E

Recycling: No soda ash was recycled by producers; however, glass container producers use cullet glass, thereby reducing soda ash consumption.

Import Sources (2021–24): Turkey, 89%; Canada, 3%; Mexico, 3%; and other, 5%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Disodium carbonate	2836.20.0000	1.2% ad valorem.

Depletion Allowance: Natural, 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Domestic production of soda ash in 2025 was estimated to have increased by 3% compared with that in 2024, and estimated exports decreased by 7%. Reported consumption decreased by 2%; however, apparent consumption increased by 7% compared with that in 2024. More than 50% of U.S. soda ash production was exported in 2025. In March, a major soda ash producer acquired a leading U.S. company based in Wyoming, which included two trona mines and associated industrial assets as part of the transaction.

Producers in China, Turkey, and the United States benefited from relatively low production costs and lower environmental impacts associated with natural soda ash. In contrast, synthetic soda ash production typically consumes more energy and costs more, placing natural soda ash producers at a competitive advantage.

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SODA ASH

China remained the leading global producer of soda ash in 2025, with an estimated output of 38 million tons, most of which was synthetic. The United States and Turkey, in descending order, were the next leading producers. Together, these three countries accounted for approximately 80% of global soda ash production. Global soda ash prices declined during 2025, owing to oversupply and weak demand from key industries. This trend was largely driven by China's expansion of natural soda ash production in Inner Mongolia, which added about 5 million tons per year of capacity in mid-2023.

World Mine Production and Reserves: Production in 2024 was revised significantly for Turkey based on company reports.

	Mine production		Reserves[5, 6]
	2024	2025[e]	
Natural:			
United States	11,700	12,000	[7]23,000,000
Botswana	298	290	16,000
Ethiopia	[e]18	18	400,000
Kenya	265	270	7,000
Turkey[8]	[e]6,100	6,000	840,000
Other countries[9]	NA	NA	280,000
World total, natural (rounded)	18,400	19,000	25,000,000
World total, synthetic	52,200	52,000	XX
World total, natural and synthetic (rounded)	70,600	71,000	XX

World Resources:[6] Natural soda ash is obtained from trona and sodium carbonate-rich brines. The world's largest deposit of trona is in the Green River Basin of Wyoming. About 47 billion tons of identified soda ash resources could be recovered from the 56 billion tons of bedded trona and the 47 billion tons of interbedded or intermixed trona and halite, which are in beds more than 1.2 meters thick. Underground room-and-pillar mining, using conventional and continuous mining, is the primary method of mining Wyoming trona ore. This method has an average mining recovery rate of 45%, whereas average recovery from solution mining is 30%. Improved solution-mining techniques, such as horizontal drilling to establish communication between well pairs, could increase this extraction rate and enable companies to develop deeper trona beds. Wyoming trona resources are being depleted at the rate of about 15 million tons per year (8.3 million tons of soda ash). Searles Lake and Owens Lake in California contain an estimated 810 million tons of soda ash reserves. At least 95 natural sodium carbonate deposits have been identified in the world, the resources of only some of which have been quantified. Although soda ash can be manufactured from salt and limestone, both of which are practically inexhaustible, synthetic soda ash is costlier to produce and generates environmental wastes.

Substitutes: Caustic soda can be substituted for soda ash in certain uses, particularly in the pulp and paper, water treatment, and certain chemical sectors. Soda ash, soda liquors, or trona can be used as feedstock to manufacture chemical caustic soda, which is an alternative to electrolytic caustic soda.

[e]Estimated. E Net exporter. NA Not available. XX Not applicable.
[1]Does not include values for soda liquors and mine waters.
[2]Natural only.
[3]Defined as production + imports – exports ± adjustments for industry stock changes.
[4]Defined as imports – exports ± adjustments for industry stock changes.
[5]The reported quantities are sodium carbonate only. About 1.8 tons of trona yields 1 ton of sodium carbonate.
[6]See Appendix C for resource and reserve definitions and information concerning data sources.
[7]From trona, nahcolite, and dawsonite deposits, in order of abundance and commercial significance.
[8]Turkey is estimated to produce synthetic soda ash; however, because the majority of soda ash production is from natural trona, Turkey's production is included in "World total, natural."
[9]China is estimated to produce natural trona; however, because the majority of soda ash production is synthetic, China's production is included in "World total, synthetic."

STONE (CRUSHED)[1]

(Data in million metric tons unless otherwise specified)

Domestic Production and Use: In 2025, an estimated 1.5 billion tons of crushed stone valued at $27 billion was produced by an estimated 1,400 companies operating 3,500 quarries and more than 180 sales and (or) distribution yards in 50 States. Leading States were, in descending order of tonnage, Texas, Pennsylvania, Florida, Missouri, Ohio, North Carolina, Tennessee, Georgia, Virginia, and Indiana, which together accounted for about 56% of total crushed stone output. Of the total crushed stone produced in 2025, about 70% was limestone and dolomite; 14%, granite; 6%, traprock; 6%, miscellaneous stone; and 3%, sandstone and quartzite; the remaining 1% was divided, in descending order of tonnage, among marble, volcanic cinder and scoria, calcareous marl, shell, and slate. An estimated 72% of crushed stone was used as a construction aggregate, mostly for road construction and maintenance; 17% for cement manufacturing; 6% for lime manufacturing; 1% for agricultural uses; and the remaining 4% for other chemical, special, and miscellaneous uses and products.

The estimated output of crushed stone in the United States shipped for consumption in the first 9 months of 2025 decreased to 1.10 billion tons from 1.11 billion tons in the same period in 2024. Third-quarter shipments for consumption increased by 7% compared with those in the same period in 2024. Additional production information, by quarter, for each State, geographic division, and the United States is reported by the U.S. Geological Survey in its quarterly Mineral Industry Surveys for construction sand and gravel and crushed stone.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Sold or used by producers	1,510	1,540	1,550	[e]1,500	1,500
Recycled material	33	33	37	37	37
Imports for consumption	19	16	14	13	10
Exports	([2])	([2])	([2])	([2])	([2])
Consumption, apparent[3]	1,560	1,590	1,610	[e]1,500	1,500
Price, average unit value, dollars per metric ton	13.26	14.31	15.86	[e]17.50	18.50
Employment, quarry and mill, number[4]	68,900	70,400	71,300	71,500	71,200
Net import reliance[5] as a percentage of apparent consumption	1	1	1	1	1

Recycling: Road surfaces made of asphalt concrete and portland cement concrete surface layers, which contain crushed stone aggregate, were recycled on a limited but increasing basis in most States. In 2025, asphalt and portland cement concrete road surfaces were recycled in all 50 States.

Import Sources (2021–24): Canada, 42%; Mexico, 23%; The Bahamas, 15%; Honduras, 15%; and other, 5%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Chalk:		
Crude	2509.00.1000	Free.
Other	2509.00.2000	Free.
Limestone, except pebbles and gravel	2517.10.0020	Free.
Crushed or broken stone	2517.10.0055	Free.
Marble granules, chippings and powder	2517.41.0000	Free.
Stone granules, chippings and powders	2517.49.0000	Free.
Limestone flux; limestone and other calcareous stone	2521.00.0000	Free.

Depletion Allowance: For some special uses, 14% (domestic and foreign); if used as ballast, concrete aggregate, riprap, road material, and similar purposes, 5% (domestic and foreign).

Government Stockpile: None.

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STONE (CRUSHED)

Events, Trends, and Issues: U.S. crushed stone production was about 1.5 billion tons in 2025, unchanged from 2024. Apparent consumption also was unchanged at 1.5 billion tons. Commercial and heavy-industrial construction activity, infrastructure funding, labor availability, new single-family housing unit starts, and weather often affect growth in construction sand and gravel production and consumption. Long-term increases in construction aggregates demand are influenced by activity in the public and private construction sectors, as well as by construction work related to infrastructure improvements around the Nation. In 2026, major capital investments in manufacturing, energy, and data-center facilities, coupled with Federal and State infrastructure funding and resilient public-sector construction activity, were expected to support continued demand across the sector.

The 2021 Infrastructure Investment and Jobs Act reauthorized surface transportation programs for 5 years and authorized investment of additional funding to repair roads and bridges and support major, transformational projects. The 2021 law authorized $55.7 billion in fiscal year (FY) 2025 and $56.8 billion in FY 2026 for Federal-Aid Highway Programs. Funding will expire at the end of FY 2026. The 2021 law also included $118 billion to the Highway Trust Fund, with $59.8 billion remaining in the highway account and $20.2 billion remaining in the mass transit account. During the first 8 months of 2025, total highway construction spending was 25% less than that in the same period in 2024.

The underlying factors that support an increase in prices for crushed stone were expected in 2026, especially in and near metropolitan areas. Shortages in some urban and industrialized areas were anticipated to continue to increase owing to local zoning regulations and land-development alternatives. These issues were likely to continue, resulting in new crushed stone quarries to be located away from large population centers. Resultant regional shortages of crushed stone and higher fuel costs could result in higher-than-average price increases in industrialized and urban areas.

The crushed stone industry continued to address health and safety regulations, permitting and zoning issues, and environmental restrictions in 2025.

World Mine Production and Reserves:

	Mine production[e]		Reserves[6]
	2024	2025	
United States	1,500	1,500	Adequate, except where special types are needed or where local shortages exist.
Other countries[7]	NA	NA	
World total	NA	NA	

World Resources:[6] Stone resources are plentiful throughout the world. The supply of high-purity limestone and dolomite suitable for specialty uses is limited in many geographic areas. The largest resources of high-purity limestone and dolomite in the United States are in the central and eastern parts of the country.

Substitutes: Crushed stone substitutes for roadbuilding include sand and gravel, and iron and steel slag. Substitutes for crushed stone used as construction aggregates include construction sand and gravel, iron and steel slag, sintered or expanded clay or shale, perlite, or vermiculite. Increasingly, recycled asphalt and portland cement concretes are used as substituted for virgin aggregate. The percentage of total aggregate supplied by recycled materials remained very small in 2025.

[e]Estimated. NA Not available.
[1]See also the Sand and Gravel (Construction) and the Stone (Dimension) chapters.
[2]Less than ½ unit.
[3]Defined as sold or used by producers + recycled material + imports – exports.
[4]Including office staff. Source: Mine Safety and Health Administration.
[5]Defined as imports – exports.
[6]See Appendix C for resource and reserve definitions and information concerning data sources.
[7]No reliable production information is available for most countries owing to the wide variety of ways in which countries report their respective crushed stone production. Some countries do not report production for this mineral commodity. Production information for some countries is available in the U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International.

STONE (DIMENSION)[1]

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: An estimated 2.3 million tons of dimension stone, valued at $460 million, was sold or used by U.S. producers in 2025. Dimension stone was produced by 150 companies operating 215 quarries in 34 States. The leading producing States were, in descending order by tonnage, Texas, Wisconsin, Vermont, Indiana, and Georgia. These five States accounted for 73% of the production quantity and contributed 57% of the domestic dimension stone value. Approximately 46%, by tonnage, of dimension stone sold or used was limestone, followed by granite (18%) and sandstone (17%); the remaining 19% was divided, in descending order of tonnage, among dolomite, slate, quartzite, marble, and miscellaneous stone. Rough stone was estimated to be 60% of the tonnage and 54% of the value of all the dimension stone sold or used by producers. The leading uses and distribution of rough stone, by tonnage, were in building and construction (60%) and as irregular-shaped stone (27%). The leading uses and distribution of dressed stone, by tonnage, were in ashlars and partially squared pieces (50%); flagging and slabs and blocks for building and construction (9% each); and roofing slate (7%).

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Sold or used by producers:[2]					
Quantity	2,360	2,440	[e]2,300	[e]2,300	2,300
Value, million dollars	415	419	[e]420	[e]430	460
Imports for consumption, value, million dollars	2,200	2,320	1,970	2,000	2,000
Exports, value, million dollars	47	48	47	51	43
Consumption, apparent, value, million dollars[3]	2,570	2,690	[e]2,300	[e]2,400	2,400
Price	Variable, depending on type of product				
Employment, quarry and mill, number[4]	3,700	3,700	3,700	3,700	3,700
Net import reliance[5] as a percentage of apparent consumption (based on value)	84	84	82	82	81
Granite only:					
Quantity, sold or used by producers	433	463	[e]430	[e]420	410
Value, sold or used by producers, million dollars	105	100	[e]110	[e]110	110
Imports, value, million dollars	903	905	751	683	670
Exports, value, million dollars	11	12	13	15	10
Consumption, apparent, value, million dollars[3]	997	992	[e]850	[e]780	770
Price	Variable, depending on type of product				
Employment, quarry and mill, number[4]	800	800	800	800	800
Net import reliance[5] as a percentage of apparent consumption (based on value)	89	90	87	86	85

Recycling: Small amounts of dimension stone were recycled, principally by restorers of old stonework.

Import Sources (2021–24, by value): All dimension stone: Brazil, 21%; Italy, 19%; China,[6] 17%; India, 16%; and other, 27%. Granite only: Brazil, 41%; India, 25%; China,[6] 17%; Italy, 6%; and other, 11%.

Tariff: Dimension stone tariffs ranged from free to 6.5% ad valorem, according to type, degree of preparation, shape, and size, for countries with normal trade relations in 2025. Most crude or roughly trimmed stone was imported at 3.7% ad valorem or less.

Depletion Allowance: All dimension stone, 14% (domestic and foreign); slate used or sold as sintered or burned lightweight aggregate, 7.5% (domestic and foreign); dimension stone used for rubble and other nonbuilding purposes, 5% (domestic and foreign).

Government Stockpile: None.

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STONE (DIMENSION)

Events, Trends, and Issues: The United States was one of the world's leading markets for dimension stone in 2025, but sales were estimated to have decreased each year since 2022. Although new home starts increased by less than 1% in 2025, total construction spending decreased by 2%, and residential spending decreased by 3% compared with those in 2024. Improvements in the economy and the residential housing market, spurred by decreased interest rates, were expected to increase demand for dimension stone in the future. The total quantity of dimension stone imported was estimated to have increased for the first time in 5 years, whereas granite imports have fluctuated annually and increased slightly in 2025 compared with those in 2024.

One of the largest granite producers in the United States suspended operations at two locations. Operations at its granite quarry in Concord, NH were temporarily halted in the summer of 2024 to allow for improvements to the 140-year-old quarry. Planned changes to the quarry footprint were intended to reduce the cost of quarrying dimension stone at this location. Granite blasted and removed during this period was expected to be sold as construction aggregate. In August 2025, the company sold its granite quarry in Mount Airy, NC, to a construction aggregates producer. The new owner was planning to reopen the operation in 2027. Both operational changes were expected to impact granite production in the short and long term.

World Mine Production and Reserves:

	Mine production[e]		Reserves[7]
	2024	2025	
United States	2,300	2,300	Adequate, except for certain special types and local shortages.
Other countries	NA	NA	
World total	NA	NA	

World Resources:[7] Dimension stone resources of the world are sufficient. Resources can be limited on a local level or occasionally on a regional level by the lack of a particular kind of stone that is suitable for dimensional purposes.

Substitutes: Substitutes for dimension stone include aluminum, brick, ceramic tile, concrete, glass, plastics, resin-agglomerated stone, and steel.

[e]Estimated. NA Not available.
[1]See also the Stone (Crushed) chapter.
[2]Includes granite, limestone, sandstone, and other types of dimension stone.
[3]Defined as sold or used + imports – exports.
[4]Excludes office staff.
[5]Defined as imports – exports.
[6]Includes Hong Kong.
[7]See Appendix C for resource and reserve definitions and information concerning data sources.

STRONTIUM

(Data in metric tons, strontium content, unless otherwise specified)

Domestic Production and Use: Domestic apparent consumption of strontium compounds and minerals increased significantly in 2025 compared with that in 2024. Apparent consumption of strontium compounds increased by 16%, and apparent consumption of the strontium mineral celestite increased to 8,100 tons in 2025 from 29 tons in 2024 but was 12% less than the recent high in 2022. Although deposits of strontium minerals occur widely throughout the United States, none have been mined since 1959. Large-scale domestic production of strontium carbonate, the principal strontium compound, ceased in 2006. Virtually all the strontium mineral celestite consumed in the United States since 2006 is estimated to have been used as an additive in drilling fluids for oil and natural-gas wells. A few domestic companies manufactured and (or) distributed small quantities of downstream strontium chemicals from imported strontium carbonate.

Based on import data, the estimated end-use distribution in the United States for strontium, including celestite and strontium compounds, was drilling fluids, 65%; ceramic ferrite magnets and pyrotechnics and signals, 14% each; and other uses, including electrolytic production of zinc, glass, master alloys, and pigments and fillers, 7%.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production	—	—	—	—	—
Imports for consumption:					
Celestite[1]	106	9,160	2,060	29	8,100
Strontium compounds[2]	5,020	5,740	3,330	3,690	4,200
Exports, strontium compounds[3]	6	15	53	61	18
Consumption, apparent:[4]					
Celestite	106	9,160	2,060	29	8,100
Strontium compounds	5,010	5,720	3,270	3,620	4,200
Total	5,120	14,900	5,330	3,650	12,000
Price, average unit value of celestite imports at port of exportation, dollars per ton	210	143	82	807	160
Net import reliance[4] as a percentage of apparent consumption	100	100	100	100	100

Recycling: None.

Import Sources (2021–24): Celestite: Mexico, >99%; other, <1%. Strontium compounds: Germany, 51%; Mexico, 41%; China, 3%; and other, 5%. Total imports: Mexico, 64%; Germany, 31%; and other, 5%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Celestite	2530.90.8010	Free.
Strontium compounds:		
Strontium metal	2805.19.1000	3.7% ad valorem.
Strontium oxide, hydroxide, peroxide	2816.40.1000	4.2% ad valorem.
Strontium nitrate	2834.29.2000	4.2% ad valorem.
Strontium carbonate	2836.92.0000	4.2% ad valorem.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile: None.

Events, Trends, and Issues: Imports of celestite were 8,100 tons in 2025 compared with 29 tons in 2024. Such fluctuations in celestite imports likely resulted from increased use in natural-gas- and oil-well-drilling fluids. Some imported celestite may have been stockpiled for future use, but stock data were not available. The weekly average active rig count[5] decreased by 6% in the first 9 months in 2025 compared with that in the same period in 2024 and remained 42% lower than that in the same period in 2019 before the global coronavirus disease 2019 (COVID-19) pandemic in 2020. In recent years, nearly all celestite imports were from Mexico and were estimated to be used as additives in drilling fluids for oil and natural-gas exploration and production. For these applications, celestite is ground but undergoes no chemical processing. In addition, celestite is the raw material from which strontium carbonate and other strontium compounds are produced. In 2024, funding through the Defense Production Act Investments program was announced to establish domestic manufacturing for 22 critical chemicals that included strontium nitrate, strontium oxalate, and strontium peroxide, among other chemicals, which may result in increased imports of celestite or strontium carbonate in the next few years. A small quantity of high-value celestite imports were also reported; these were most likely mineral specimens.

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STRONTIUM

Imports of strontium compounds were estimated to have increased by 14% in 2025. Strontium carbonate is the most traded strontium compound and is used as the raw material from which other strontium compounds are derived. Strontium carbonate is sintered with iron oxide to produce permanent ceramic ferrite magnets. Strontium nitrate, the second most traded strontium compound, contributes a brilliant red color to fireworks and signal flares. Smaller quantities of these and other strontium compounds and strontium metal were consumed in several other applications, including electrolytic production of zinc, glass production, master alloys, and pigments and fillers. Various novel applications of strontium, such as its use in medical and technological applications, ultraprecise atomic optical clocks, and strontium-based power systems, as well as applications for photoluminescence, continue to be researched. Although strontium carbonate was not produced in the United States, in September an Australia-based company announced its acquisition of a 100% interest in a strontium deposit in California and planned to undertake an exploration and confirmatory drilling program for mineralization. Additionally, a United States-based mining company planned to recommence precious and base metals mining at a site in Montana, and the potential for the extraction of strontium from this project was being researched.

In 2025, a strontium optical lattice clock went on sale for $3.3 million in Japan; it was thought that customers would use the clock to advance scientific research. In August, a research team of scientists announced the discovery of the new mineral amaterasuite. Its chemical formula is $Sr_4Ti_6Si_4O_{23}(OH)Cl$, and it has been officially recognized by the International Mineralogical Association. Strontium was variously included or not included on critical minerals lists developed by several countries and regions.

World celestite production was estimated to be 450,000 tons in 2025 compared with 400,000 tons in 2024. In contrast, global strontium carbonate supply was disrupted in 2025 owing to reduced output from China, a major explosion at a port in Iran, and fire damage to a plant in Mexico.

World Mine Production and Reserves:[6] Production in 2024 for Spain was revised significantly based on a Government report. Reserves for Iran were revised based on company reports.

	Mine production[e] 2024	Mine production[e] 2025	Reserves[7]
United States	—	—	NA
Argentina	700	700	NA
China	80,000	80,000	12,000,000
Iran	200,000	250,000	2,000,000
Mexico	[8]19,000	20,000	NA
Spain	100,000	100,000	NA
World total (rounded)	400,000	450,000	Large

World Resources:[7] World resources of strontium may exceed 1 billion tons.

Substitutes: Barium can be substituted for strontium in ceramic ferrite magnets; however, the resulting barium composite will have a reduced maximum operating temperature when compared with that of strontium composites. Substituting for strontium in pyrotechnics is hindered by difficulty in obtaining the desired brilliance and visibility imparted by strontium and its compounds. In drilling mud, barite is the preferred material, but celestite may substitute for some barite, especially when barite prices are high.

[e]Estimated. NA Not available. — Zero.
[1]The strontium content of celestite ore is 43.88%, which was used to convert units of gross weight celestite ore to strontium content.
[2]Strontium compounds (with their respective strontium contents) include metal (100%); oxide, hydroxide, and peroxide (70%); carbonate (59.35%); and nitrate (41.40%). These factors were used to convert gross weight of strontium compounds to strontium content.
[3]Calculated from Schedule B number 2836.92.0000 for strontium carbonate. Exports of other strontium compounds are not included because these shipments likely consisted of materials misclassified as strontium compounds.
[4]Defined as imports − exports.
[5]Source: Baker Hughes Co., 2025, Rig count overview & summary count: Baker Hughes Co. (Accessed November 4, 2025, at https://rigcount.bakerhughes.com/na-rig-count.)
[6]Gross weight of celestite in tons.
[7]See Appendix C for resource and reserve definitions and information concerning data sources.
[8]Reported.

SULFUR

(Data in thousand metric tons, sulfur content, unless otherwise specified)

Domestic Production and Use: In 2025, recovered elemental sulfur and byproduct sulfuric acid were produced at 86 operations in 26 States. Total shipments in 2025 were valued at about $1.4 billion, $1 billion more than the value of shipments in 2024 owing to the price increasing to $180 per ton from $46 per ton. Elemental sulfur production was estimated to be 7.6 million tons; Louisiana and Texas accounted for about 54% of domestic production. Elemental sulfur was recovered, in descending order of tonnage, at petroleum refineries, natural-gas-processing plants, and coking plants by 31 companies at 81 plants in 25 States. Byproduct sulfuric acid, representing about 6% of production of sulfur in all forms, was recovered at five nonferrous-metal smelters in four States by four companies. Domestic elemental sulfur accounted for 63% of domestic consumption, and byproduct sulfuric acid accounted for about 3%. The remaining 34% of sulfur consumed was provided by imported sulfur and sulfuric acid. About 90% of sulfur consumed was in the form of sulfuric acid.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production:					
Recovered elemental	7,470	8,010	8,010	7,790	7,600
Other forms	600	636	640	527	500
Total (rounded)	8,070	8,640	8,650	8,320	8,100
Shipments, all forms	8,080	8,640	8,660	8,080	7,900
Imports for consumption:					
Recovered elemental[e]	3,470	2,910	2,390	2,260	2,000
Sulfuric acid	1,070	1,060	1,080	1,150	1,100
Exports:					
Recovered elemental	1,900	1,740	1,920	2,080	1,800
Sulfuric acid	129	97	64	55	65
Consumption, apparent, all forms[1]	10,600	10,800	10,200	9,360	9,100
Price, average unit value, free on board, mine and (or) plant, dollars per metric ton of elemental sulfur	90.40	177.8	58.90	46.42	180
Stocks, producer, yearend	113	125	122	114	116
Employment, mine and (or) plant, number	2,400	2,400	2,400	2,400	2,400
Net import reliance[2] as a percentage of apparent consumption	24	20	15	14	14

Recycling: Typically, between 2.5 million and 5 million tons of spent sulfuric acid is reclaimed from petroleum refining and chemical processes during any given year.

Import Sources (2021–24): Elemental: Canada, 53%; Mexico, 7%; Iraq, 6%; Kazakhstan, 6%; and other, 28%. Sulfuric acid: Canada, 54%; Mexico, 22%; Spain, 7%; and other, 17%. Total sulfur imports: Canada, 53%; Mexico, 11%; Kazakhstan, 5%; Iraq, 4%; and other, 27%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Sulfur, crude or unrefined	2503.00.0010	Free.
Sulfur, all kinds, other	2503.00.0090	Free.
Sulfur, sublimed or precipitated	2802.00.0000	Free.
Sulfuric acid	2807.00.0000	Free.

Depletion Allowance: 22% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Total U.S. sulfur production and shipments in 2025 were estimated to be 3% less and slightly less, respectively, than those in 2024. Domestic production of elemental sulfur from petroleum refineries and recovery from natural gas operations was estimated to have decreased by 3%. Domestically, refinery sulfur production was expected to remain about the same as refining utilization remains high. Domestic byproduct sulfuric acid production was expected to decrease slightly because several nonferrous-metal smelters experienced periods of planned maintenance.

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SULFUR

Domestic phosphate rock consumption in 2025 was estimated to have decreased compared with that in 2024, which indicated a slight decrease in the amount of sulfur needed to process the phosphate rock into phosphate fertilizers. New sulfur demand associated with phosphate fertilizer projects was expected mostly in Africa and west Asia.

World sulfur production in 2025 was an estimated 84 million tons compared with 83.9 million tons in 2024. Sulfur production was expected to increase owing to upgrades and new refining projects. Also, an increase in nickel production from high-pressure acid leach projects to produce battery materials was expected to increase sulfur demand.

Contract sulfur prices in Tampa, FL, began 2025 at $116 per long ton. The sulfur price increased to $270 per long ton in early April, then decreased to $252 per long ton in early July, and increased to $310 per long ton in early October 2025. In the past few years, sulfur prices have fluctuated considerably, and the prices in the fourth quarter of 2025 were the highest prices since the second quarter of 2022.

World Production and Reserves:

	Production, all forms[e]	
	2024	2025
United States[4]	8,320	8,100
Australia	900	900
Canada[4]	5,060	5,000
Chile	1,500	1,400
China[5]	19,000	19,000
India	3,700	3,700
Iran	2,000	2,100
Japan[4]	2,750	2,700
Kazakhstan[4]	4,740	4,800
Korea, Republic of	3,100	3,100
Kuwait	1,300	1,300
Poland	1,000	1,100
Qatar	3,000	3,100
Russia	7,400	7,500
Saudi Arabia	7,200	7,200
Turkmenistan	880	870
United Arab Emirates	6,300	6,300
Other countries	5,100	5,700
World total (rounded)	83,900	84,000

Reserves[3]

Reserves of sulfur in crude oil, natural gas, and sulfide ores are large. Because most sulfur production is a result of the processing of fossil fuels, supplies are expected to be adequate for the foreseeable future. Because petroleum and sulfide ores can be processed long distances from where they are produced, sulfur production may not be in the country to which the reserves were attributed. For instance, sulfur from Saudi Arabian oil may be recovered at refineries in the United States.

World Resources:[3] Resources of elemental sulfur in evaporite and volcanic deposits, and sulfur associated with natural gas, petroleum, tar sands, and metal sulfides, total about 5 billion tons. The sulfur in gypsum and anhydrite is almost limitless, and 600 billion tons of sulfur is contained in coal, oil shale, and shale that is rich in organic matter. Production from these sources would require development of low-cost methods of extraction. The domestic sulfur resource is about one-fifth of the world total.

Substitutes: Substitutes for sulfur at present or anticipated price levels are not satisfactory; some acids, in certain applications, may be substituted for sulfuric acid, but usually at a higher cost.

[e]Estimated.
[1]Defined as shipments + imports – exports ± adjustments for industry stock changes.
[2]Defined as imports – exports ± adjustments for industry stock changes.
[3]See Appendix C for resource and reserve definitions and information concerning data sources.
[4]Reported for 2024.
[5]Sulfur production in China includes byproduct elemental sulfur recovered from natural gas and petroleum, the estimated sulfur content of byproduct sulfuric acid from metallurgy, and the sulfur content of sulfuric acid from pyrite.

TALC AND PYROPHYLLITE[1]

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: Three companies operated five talc-producing mines in three States during 2025, and domestic production of crude talc was estimated to have increased to 490,000 tons valued at $28 million. Talc was mined in Montana, Texas, and Vermont. Total sales of talc by U.S. producers were estimated to be 460,000 tons valued at about $150 million. Talc produced and sold in the United States was used in plastics, 36%; paint, 19%; ceramics (including automotive catalytic converters), 17%; paper, 12%; roofing, 8%; and rubber, 2%. The remaining 6% was for agriculture, cosmetics, export, insecticides, and other miscellaneous uses.

Two companies in North Carolina mined and processed pyrophyllite in 2025. Domestic production data were withheld to avoid disclosing company proprietary data and were essentially unchanged from those in 2024. Pyrophyllite was sold for ceramic, paint, and refractory products.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production, mine	577	511	508	457	490
Sold by producers	556	557	529	472	460
Imports for consumption	278	346	235	232	260
Exports	236	203	204	180	120
Consumption, apparent[2]	598	700	560	524	600
Price, average, milled, dollars per metric ton[3]	322	298	333	331	330
Employment, mine and mill, number:[4]					
Talc	334	362	343	339	340
Pyrophyllite	32	37	38	37	33
Net import reliance[5] as a percentage of apparent consumption	7	20	6	10	23

Recycling: Insignificant.

Import Sources (2021–24): Pakistan, 52%; Canada, 24%; China, 12%; and other, 12%. Large quantities of crude talc were estimated to have been mined in Afghanistan before being milled in and exported from Pakistan.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Natural steatite and talc:		
Not crushed, not powdered	2526.10.0000	Free.
Crushed or powdered	2526.20.0000	Free.
Talc, steatite, and soapstone; cut or sawed	6815.99.2000	Free.

Depletion Allowance: Block steatite talc, 22% (domestic), 14% (foreign); other talc and pyrophyllite, 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Canada, China, and Pakistan were the principal sources of United States talc imports in recent years. Imports of talc and related materials were estimated to have increased by 12% in 2025 compared with those in 2024. Imports from Pakistan decreased by about 9% in 2025 and accounted for about 49% of total imports. Imports from Canada decreased by 21% and accounted for 20% of the total. Imports from China increased by approximately 125% and accounted for approximately 27% of total imports. Mexico, Canada, and China, in descending order of quantity, were the primary destinations for United States talc exports, collectively receiving about 70% of exports. Exports were estimated to have decreased by 65% in 2025 compared with those in 2024.

Owing to concerns regarding asbestos contamination in talc and risks associated with talc exposure, regulatory bodies began assessing protective measures and classification criteria for talc-containing products. In December 2024, the U.S. Food and Drug Administration proposed stricter testing protocols for talc products to detect and prevent asbestos contamination in talc-containing cosmetics as mandated by the Modernization of Cosmetics Regulation Act of 2022. The comment period for the proposal ended in March 2025.

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TALC AND PYROPHYLLITE

The European Chemicals Agency's Committee for Risk Assessment issued a final opinion in July 2025 recommending the classification of talc as a Category 1B carcinogen (H350: "may cause cancer") and as a Specific Target Organ Toxicant–Repeated Exposure Category 1 (STOT RE 1, H372: "causes damage to lungs through prolonged or repeated inhalation exposure"). This conclusion was based on evidence from animal studies showing lung tumors in rats, human epidemiological data linking perineal talc use to ovarian cancer, and mechanistic data indicating talc-induced inflammation and oxidative stress. The classification applies to all routes of exposure because there was insufficient evidence to exclude any specific route.

Ceramic tile and sanitaryware formulations and the technology for firing ceramic tile changed over recent decades, reducing the amount of talc required for the manufacture of some ceramic products. For paint, the industry shifted its focus to production of water-based paint (a product for which talc is not well suited because it is hydrophobic) from oil-based paint in order to reduce volatile emissions. The amount of talc used for paper manufacturing began to decrease in the 1990s. Some talc used for pitch control was replaced by chemical agents.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Brazil, Canada, China, France, India, South Africa, and Turkey based on company and Government reports. Reserves for Brazil were revised based on Government reports.

	Mine production[e]		Reserves[6]
	2024	2025	
United States (crude)	[7]457	490	140,000
Afghanistan	190	200	Large
Brazil (crude and beneficiated)[8]	[7]649	570	48,000
Canada (unspecified minerals)[8]	150	150	NA
China (unspecified minerals)	1,300	1,300	60,000
Finland	[7]212	200	Large
France (crude)	280	300	Large
India (steatite)[8]	1,540	1,500	110,000
Italy (includes steatite)	170	170	NA
Japan[8]	130	130	100,000
Korea, Republic of[8]	[7]322	300	81,000
Pakistan (steatite)	[7]221	200	NA
South Africa[8]	[7]390	300	NA
Turkey[8]	[7]304	300	15,000
Other countries (includes crude)[8]	885	790	Large
World total (rounded)	7,200	6,900	Large

World Resources:[7] The United States is self-sufficient in most grades of talc and related minerals, but lower priced imports have replaced domestic sources for some uses. Talc occurs in the United States, from New England to Alabama in the Appalachian Mountains and the Piedmont region, as well as in California, Montana, Nevada, Texas, and Washington. Domestic and world identified resources are estimated to be approximately five times the quantity of reserves.

Substitutes: Substitutes for talc include bentonite, chlorite, feldspar, kaolin, and pyrophyllite in ceramics; chlorite, kaolin, and mica in paint; calcium carbonate and kaolin in paper; bentonite, kaolin, mica, and wollastonite in plastics; and kaolin and mica in rubber.

[e]Estimated. NA Not available.
[1]All statistics do not include pyrophyllite unless otherwise specified.
[2]Defined as sold by producers + imports – exports.
[3]Average ex-works unit value of milled talc sold by U.S. producers, based on data reported by companies.
[4]Includes only companies that mine talc or pyrophyllite. Excludes office workers and mills that process imported or domestically purchased material.
[5]Defined as imports – exports.
[6]See Appendix C for resource and reserve definitions and information concerning data sources.
[7]Reported.
[8]Includes pyrophyllite.

TANTALUM

(Data in metric tons, tantalum content, unless otherwise specified)

Domestic Production and Use: Tantalum has not been mined in the United States since 1959. Domestic tantalum resources are low grade; some are mineralogically complex, and most are not commercially recoverable. Companies in the United States produced tantalum alloys, capacitors, carbides, compounds, and tantalum metal from imported tantalum ores and concentrates and tantalum-containing materials. Tantalum metal and alloys were recovered from foreign and domestic scrap. Domestic tantalum consumption was not reported by consumers. The value of tantalum consumed in 2025 was estimated to be $190 million as measured by the value of imports.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production:					
Mine	—	—	—	—	—
Secondary	NA	NA	NA	NA	NA
Imports for consumption[1]	1,330	1,720	1,110	1,070	1,300
Exports[1]	655	662	672	506	420
Shipments from Government stockpile[2]	−10	—	NA	NA	NA
Consumption, apparent[3]	663	1,060	[4]440	566	890
Price, tantalite, annual average, dollars per kilogram of tantalum oxide (Ta_2O_5) content[5]	158	196	170	167	180
Net import reliance[6] as a percentage of apparent consumption	100	100	100	100	100

Recycling: Tantalum was recycled mostly from new scrap generated during the manufacture of tantalum-containing electronic components and from tantalum-containing cemented carbide and superalloy scrap. The amount of tantalum recycled was not available, but it may account for as much as 30% of consumption by domestic primary processors.

Import Sources (2021–24): Tantalum ores and concentrates: Australia, 64%; Congo (Kinshasa), 9%; Mozambique, 10%; United Arab Emirates, 5%; and other, 12%. Tantalum metal and powder: China,[7] 47%; Germany, 25%; Kazakhstan, 16%; Thailand, 4%; and other, 8%. Tantalum waste and scrap: Indonesia, 18%; Republic of Korea, 18%; Japan, 12%; China,[7] 8%; and other, 44%. Total: China,[7] 22%; Australia, 14%; Germany, 11%; Indonesia, 7%; and other, 46%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Synthetic tantalum-niobium concentrates	2615.90.3000	Free.
Niobium ores and concentrates	2615.90.6030	Free.
Tantalum ores and concentrates	2615.90.6060	Free.
Tantalum oxide	2825.90.9000	3.7% ad valorem.
Potassium fluorotantalate	2826.90.9090	3.1% ad valorem.
Tantalum, unwrought:		
Powders	8103.20.0030	2.5% ad valorem.
Alloys and metal	8103.20.0090	2.5% ad valorem.
Tantalum, waste and scrap	8103.30.0000	Free.
Tantalum, wrought:		
Crucibles	8103.91.0000	4.4% ad valorem.
Other	8103.99.0000	4.4% ad valorem.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile:[8]

	FY 2025		FY 2026	
Material	Potential acquisitions	Potential disposals	Potential acquisitions	Potential disposals
Tantalum metal	29.26	0.09	NA	NA

Events, Trends, and Issues: In 2025, U.S. tantalum apparent consumption (measured in tantalum content) was estimated to be 890 tons, a 58% increase from that in 2024. The estimated U.S. imports for consumption for 2025 increased by 22%, and exports decreased by 17% in 2025 from that in 2024. The value of waste and scrap imports increased by 40%, whereas the value of primary metal decreased by 20% compared with that in 2024. As of November 2025, the average monthly price for tantalum ore was $180 per kilogram of Ta_2O_5 content.

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TANTALUM

In June, the U.S. Department of State reported that the Governments of Congo (Kinshasa) and Rwanda signed a peace agreement. The accord, mediated by the United States and observed by Qatar, called for ending support to nonstate armed groups, respecting territorial sovereignty, and establishing joint security and oversight mechanisms. If sustained, the agreement was expected to improve stability in eastern Congo (Kinshasa) and strengthen conditions for regional mineral trade, which included tantalum.

In September, the U.S. Defense Logistics Agency awarded an $8.6 million delivery order to a company with tantalum processing operations in Boyertown, PA, to supply tantalum ingots for the National Defense Stockpile. The company also was awarded a separate 5-year contract for as much as $100 million to maintain a domestic source of tantalum processed directly from ore for defense and aerospace applications. Tantalum ingots were used to produce high-temperature superalloys and metal powders for high-reliability electronic components.

World Mine Production and Reserves: Production in 2024 for Congo (Kinshasa) was revised significantly based on a Government report. Reserves for Australia and Russia were revised based on company and Government reports.

	Mine production^e		Reserves[9]
	2024	2025^e	
United States	—	—	—
Australia	52	50	[10]120,000
Bolivia	2	2	NA
Brazil	[11]210	190	40,000
Burundi	2	2	NA
China	76	80	240,000
Congo (Kinshasa)	1,270	1,300	NA
Ethiopia	40	40	NA
Mozambique	[11]55	1	NA
Nigeria	390	390	NA
Russia	29	30	150
Rwanda	374	400	NA
World total (rounded)	2,500	2,500	NA

World Resources:[9] Identified world resources of tantalum, most of which are in Australia, Brazil, Canada, and China, are considered adequate to supply projected needs. The United States has about 55,000 tons of tantalum resources in identified deposits, most of which were considered subeconomic at 2025 prices for tantalum.

Substitutes: The following materials can be substituted for tantalum, but performance loss or higher costs may ensue: niobium and tungsten in carbides; aluminum, ceramics, and niobium in electronic capacitors; glass, molybdenum, nickel, niobium, platinum, stainless steel, titanium, and zirconium in corrosion-resistant applications; and hafnium, iridium, molybdenum, niobium, rhenium, and tungsten in high-temperature applications.

^{e}Estimated. NA Not available. — Zero.

[1]Imports and exports include the estimated tantalum content of synthetic tantalum-niobium concentrates, niobium and tantalum ores and concentrates, tantalum waste and scrap, unwrought tantalum alloys and powder, and other tantalum articles. Synthetic concentrates and niobium ores and concentrates were assumed to contain 50% Ta_2O_5. Tantalum ores and concentrates were assumed to contain 32% Ta_2O_5. Niobium ores and concentrates were assumed to contain 28% Ta_2O_5. Ta_2O_5 is 81.897% tantalum.

[2]Defined as change in total inventory from prior yearend inventory. If negative, increase in inventory. Beginning in 2023, Government stock changes no longer available.

[3]Defined for 2021–22 as production + imports − exports ± adjustments for Government and industry stock changes. Beginning in 2023, Government stock changes no longer included.

[4]Decrease in apparent consumption is due to a decline in imports for consumption caused by stockpiling in 2022.

[5]Sources: CRU Group (2021), the Institute for Rare Earths and Metals (2022–24), and Asian Metal (2025).

[6]Defined for 2021–22 as imports − exports ± adjustments for Government and industry stock changes. Beginning in 2023, Government stock changes no longer included.

[7]Includes Hong Kong.

[8]See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.

[9]See Appendix C for resource and reserve definitions and information concerning data sources.

[10]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 33,000 tons.

[11]Reported.

TELLURIUM

(Data in metric tons, tellurium content, unless otherwise specified)

Domestic Production and Use: Tellurium is recovered principally as a byproduct of the electrolytic refining of primary copper, where it accumulates in the residues of copper anodes. In 2025, two primary electrolytic copper refineries operated in the United States, one in Texas and one in Utah, and produced copper telluride from tellurium-bearing anode slimes. Tellurium was not refined in the United States; copper telluride from both U.S. facilities was exported for further processing. Downstream companies processed imported tellurium to manufacture high-purity tellurium products, tellurium compounds for specialty applications, and tellurium dioxide. Domestic tellurium production, consumption, and stocks were withheld to avoid disclosing company proprietary data.

Tellurium was used predominantly in the production of cadmium telluride (CdTe) for thin-film solar cells. Another significant application was for the production of bismuth telluride (BiTe), which is used in thermoelectric devices for cooling and energy generation. Metallurgical uses were as an alloying additive in steel to improve machining characteristics, in cast iron to control the depth of chill, in lead alloys to improve resistance to vibration and fatigue, in malleable iron as a carbide stabilizer, and as a minor additive in copper alloys to improve machinability without reducing conductivity. Tellurium also was used in blasting caps, in the chemical industry as an accelerator and vulcanizing agent in the processing of rubber, as a component of catalysts for synthetic fiber production, in photodetectors, as pigments to produce various colors in glass and ceramics, and in thermal-imaging devices. In 2025, estimated end uses for tellurium in global consumption were solar power cells, 70%; thermoelectric devices, 15%; metallurgy, 10%; and other applications, 5%.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production, copper telluride	W	W	W	W	W
Imports for consumption	42	37	8	6	14
Exports[1]	2	1	15	3	3
Consumption, apparent[2]	W	W	W	W	W
Price, annual average, dollars per kilogram:					
United States[3]	69.72	70.34	79.09	74.77	120
Europe[4]	67.26	68.10	76.74	81.54	150
Stocks, producer, yearend	W	W	W	W	W
Net import reliance[5] as a percentage of apparent consumption	>95	>75	E	<25	>25

Recycling: Tellurium was recycled from CdTe solar cells in the United States, but the quantity recycled was limited because most of these cells were relatively new and had not reached the end of their useful life.

Import Sources (2021–24): Canada, 64%; Philippines, 14%; Japan, 8%; Germany, 5%; and other, 9%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Tellurium	2804.50.0020	Free.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: The supply of tellurium is directly affected by the supply of materials from which it is a byproduct, primarily copper. Recovery of copper telluride from domestic copper anode slimes was estimated to have decreased in 2025 from that in 2024, reflecting lower output of copper cathodes from primary electrolytic refineries in the United States. In August 2025, the leading U.S. producer of solar modules opened its fifth domestic manufacturing plant. Production at the new facility was expected to begin by yearend 2026 and to ramp up in the first half of 2027. The company, which predominantly manufactured CdTe modules, projected that it would produce as much as 14 gigawatts per year of solar panels in the United States at full capacity.

As of February 2025, exporters in China were required to submit documents to the Government that verified the end users and end uses of tellurium shipments to foreign markets. The typical issuance time of an export license was 45 days, and a new license was required for any change in the recipient or intended use. In Europe, these export controls significantly limited the availability of tellurium; consequently, the annual average price for tellurium increased by 84% to an estimated $150 per kilogram in 2025 from $81.54 per kilogram in 2024. Supply restrictions in Europe resulted in increased spot buying in the United States, and the annual average price for tellurium in U.S. warehouses increased by 60% to an estimated $120 per kilogram in 2025 from $74.77 per kilogram in 2024.

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TELLURIUM

China was the leading producer of refined tellurium in 2025 and accounted for 80% of estimated global production (excluding production in multiple countries for which available information was inadequate to make reliable estimates of output). Tellurium production in China increased significantly over the past 10 years, corresponding with an increase of nearly 75% in the production capacity of electrolytically refined copper. The production capacity of copper anodes, the feedstock material for electrolytic copper refineries, more than doubled over the same time period.

World Refinery Production and Capacity:

	Refinery production[e, 6]		Refinery capacity[e, 6]
	2024	2025	
United States (copper telluride)	W	W	W
Bulgaria	1	1	5
Canada	27	28	30
China	750	800	1,000
Japan	70	61	75
Russia	64	67	80
South Africa	5	5	10
Sweden (concentrate)	[7]46	48	50
Uzbekistan	18	18	50
Other countries[8]	NA	NA	NA
World total (rounded)	[9]981	[9]1,000	1,300

World Resources:[10] Reserves and resources of tellurium are generally not reported at the mine or country level and cannot be reliably quantified. More than 90% of tellurium has been produced from anode slimes as a byproduct of primary electrolytic copper refining, and the remainder was derived from skimmings at lead refineries and from flue dusts and gases generated during the smelting of bismuth, copper, and lead-zinc ores. Other potential sources of tellurium include bismuth telluride and gold telluride ores.

Substitutes: Several materials can replace tellurium in most of its uses, but usually with losses in efficiency or product characteristics. Amorphous silicon and copper indium gallium diselenide are the two principal competitors with CdTe in thin-film photovoltaic cells. Bismuth selenide and organic polymers can substitute for BiTe in some thermoelectric devices. Bismuth, calcium, lead, phosphorus, selenium, and sulfur can replace tellurium in many free-machining steels. Several of the chemical process reactions catalyzed by tellurium can be carried out with other catalysts or by means of noncatalyzed processes. In rubber compounding, selenium and (or) sulfur can substitute as vulcanization agents. The selenides and sulfides of niobium and tantalum can serve as electrical-conducting solid lubricants in place of tellurides of those metals.

[e]Estimated. E Net exporter. NA Not available. W Withheld to avoid disclosing company proprietary data.
[1]May include exports of copper telluride.
[2]Defined as production (tellurium content of copper telluride) + imports – exports ± adjustments for industry stock changes.
[3]Minimum purity of 99.95%, free on board, U.S. warehouse. Source: Argus Media group, Argus Non-Ferrous Markets.
[4]Minimum purity of 99.99%, in warehouse, Rotterdam. Source: Argus Media group, Argus Non-Ferrous Markets.
[5]Defined as imports – exports ± adjustments for industry stock changes.
[6]Unless otherwise noted, data are for refined tellurium only to the extent possible. Countries that produced tellurium contained in copper ore and concentrate, copper smelter products (such as blister and anodes), copper refinery residues (such as anode slimes), and (or) other tellurium-containing materials but did not recover refined tellurium are excluded.
[7]Reported.
[8]In addition to the countries listed, Australia, Belgium, Chile, Germany, India, Indonesia, the Republic of Korea, and the Philippines may have produced refined tellurium, but available information was inadequate to make reliable estimates of output.
[9]Excludes U.S. production.
[10]See Appendix C for resource and reserve definitions and information concerning data sources.

THALLIUM

(Data in kilograms unless otherwise specified)

Domestic Production and Use: There has been no domestic production of thallium since 1981. Small quantities are consumed annually, but variations in pricing and value complicate making accurate estimates of consumption value. The primary end uses included the following: radioisotope thallium-201 used for medical purposes in cardiovascular imaging; thallium used as an activator (sodium iodide crystal doped with thallium) in electronics for photoelectric cells and gamma radiation detection; thallium-barium-calcium-copper-oxide high-temperature superconductors; thallium used in lenses, prisms, and windows for infrared detection and transmission equipment; thallium-arsenic-selenium crystal filters used for light diffraction in acousto-optical measuring devices; and thallium used in mercury alloys for low temperature low-temperature thermometers and switches. Other uses include as an additive in glass to increase its refractive index and density, a catalyst for organic compound synthesis, a component in high-density liquids (thallium malonate formate or Clerici solution) for gravity separation of minerals.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production, refinery	—	—	—	—	—
Imports for consumption:					
Unwrought metal and metal powders	—	—	13	—	—
Waste and scrap	—	13	—	([1])	—
Other articles	7	—	[2]300	—	25
Exports:					
Unwrought metal and powders	190	—	1	—	—
Waste and scrap	—	—	—	—	—
Other articles	378	2,150	3,800	3,190	2,800
Consumption, estimated[3]	7	13	13	—	25
Price, metal, dollars per kilogram[e, 4]	8,400	9,400	8,800	9,500	9,300
Net import reliance[5] as a percentage of estimated consumption	NA	NA	NA	NA	NA

Recycling: None.

Import Sources (2021–2024): Mexico, 90%; France, 4%, Japan, 4%; and Israel, 2%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Unwrought and powders	8112.51.0000	4% ad valorem.
Waste and scrap	8112.52.0000	Free.
Other	8112.59.0000	4% ad valorem.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: As of July 2025, there were no reported imports or exports of unwrought thallium metal. Also, there have been no reported imports or exports of thallium waste and scrap since 2023. However, according to data from the U.S. Census Bureau, a significant quantity of thallium waste and scrap (1,620 kilograms) was imported to Puerto Rico from the Dominican Republic in July 2024, marking a notable shift as this country had not been an import source in previous years. This was likely due to the misclassification of commodities such as medical devices or equipment containing thallium. Exports of thallium articles also decreased to 2,800 kilograms in 2025 from 3,190 kilograms in 2024 and 3,800 kilograms in 2023. Data on inventory for domestic use remained unavailable.

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THALLIUM

The primary global uses for thallium include gamma radiation detection equipment, high-temperature superconductors, infrared optical materials, low-melting glass, photoelectric cells, and radioisotopes. Demand for thallium in medical nuclear imaging applications continued to decline owing to the superior performance and availability of alternatives, such as technetium-99m, although thallium was still used in certain cardiovascular stress tests. Research continued into innovative applications for thallium, including enhancements in scintillators for radiation detection and new thallium compounds for optoelectronic devices.

Thallium metal and its compounds are highly toxic materials and are strictly controlled to prevent harm to humans and the environment. Thallium and its compounds can enter the human body by skin contact, ingestion, or inhalation of dust or fumes. Under its national primary drinking water regulations, the U.S. Environmental Protection Agency has set an enforceable Maximum Contaminant Level of 2 parts per billion thallium in drinking water.

World Refinery Production and Reserves:[6] Thallium is produced commercially in only a few countries as a byproduct recovered from flue dust in the roasting of copper, lead, and zinc ores. Because most producers withhold thallium production data, global production data were limited. In 2023 (the latest year for which data were available), global production of thallium was estimated to be about 10,000 kilograms. China, Kazakhstan, and Russia were estimated to be leading producers of primary thallium. Substantial thallium-rich deposits have been identified in Brazil, China, North Macedonia, and Russia. Quantitative estimates of reserves were not available, owing to the difficulty in identifying deposits where thallium can be extracted economically. Previous estimates of reserves were based on the thallium content of zinc ores.

World Resources:[6] Although thallium is reasonably abundant in the Earth's crust, estimated at about 0.7 part per million, it exists mostly in association with potassium minerals in clays, granites, and soils, and it is not generally considered to be commercially recoverable from those materials. The major source of recoverable thallium is from trace amounts found in sulfide ores of copper, lead, zinc, and other metallic elements. Recent studies in northeastern China have revealed volcano-related uranium-molybdenum-thallium mineralization, indicating additional geologic environments in which thallium resources may be present. As such, world resources of thallium are adequate to supply world requirements.

Substitutes: Although other materials and formulations can substitute for thallium in gamma radiation detection equipment and optics used for infrared detection and transmission, thallium materials are presently superior and more cost effective for these very specialized uses. The medical isotope technetium-99m is being used in cardiovascular-imaging applications instead of thallium. Nontoxic substitutes, such as tungsten compounds, are being marketed as substitutes for thallium in high-density liquids for gravity separation of minerals.

[e]Estimated. NA Not available. — Zero.
[1]Imports of thallium waste and scrap, HTS code 8112.52.000, were reported by the U.S. Census Bureau as 1,620 kilograms in 2024. However, this number may include material that may have been misclassified.
[2]Includes material that may have been misclassified.
[3]Estimated to be equal to total imports for 2021–22 and 2024–25. In 2023, consumption was estimated to be equal to imports of unwrought metal and metal powders.
[4]Estimated average price of thallium 99.99%-pure granules in 100-gram lots from three retailers and producers as of November 7, 2025.
[5]Defined as imports – exports. Consumption and exports of unwrought thallium were from imported material or from a drawdown in unreported inventories.
[6]See Appendix C for resource and reserve definitions and information concerning data sources.

THORIUM

(Data in kilograms unless otherwise specified)

Domestic Production and Use: The world's primary source of thorium is the rare-earth and thorium phosphate mineral monazite. In 2025, monazite may have been produced as a separated concentrate or included as an accessory mineral in heavy-mineral concentrates, but thorium was not separated or recovered by any domestic facility. Essentially, all thorium compounds and alloys consumed by the domestic industry were derived from imports. The number of companies that processed or fabricated various forms of thorium for commercial use was not available. Thorium's use in most products was generally limited because of concerns over its naturally occurring radioactivity. Imports of thorium compounds are sporadic owing to changes in consumption and fluctuations in consumer inventory levels. The estimated value of thorium compounds imported for consumption by the domestic industry in 2025 was $118,000 (based on data through July 2025), compared with $120,000 in 2024.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production, mine (monazite)[1]	W	W	W	W	W
Imports for consumption:					
Ore and concentrates (monazite)	16,000	—	—	—	—
Compounds (oxide, nitrate, and so forth)	5,790	1,930	13,300	4,310	5,000
Exports:					
Ore and concentrates (monazite)	—	22,000	—	—	—
Compounds (oxide, nitrate, and so forth)[2]	45,600	25,900	65,000	51,400	1,500
Consumption, apparent:[3]					
Ore and concentrates (monazite)	W	W	W	W	W
Compounds (oxide, nitrate, and so forth)	NA	NA	NA	NA	3,500
Price, average unit value of imports, compounds, dollars per kilogram:[4]					
India	NA	NA	74	NA	NA
France	29	26	29	27	26
Net import reliance[5] as a percentage of apparent consumption	NA	NA	NA	NA	NA

Recycling: None.

Import Sources (2021–24): Ores and concentrates (monazite): China, 100%. Thorium compounds: France, 51%; India, 47%; and other, 2%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Thorium ore and concentrates (monazite)	2612.20.0000	Free.
Thorium compounds	2844.30.1000	5.5% ad valorem.

Depletion Allowance: Monazite, 22% on thorium content and 14% on rare-earth and yttrium content (domestic); 14% (foreign).

Government Stockpile: None.

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THORIUM

Events, Trends, and Issues: Domestic demand for thorium alloys, compounds, and metals was limited. In addition to research purposes, various commercial uses of thorium included catalysts, high-temperature ceramics, magnetrons in microwave ovens, metal-halide lamps, nuclear medicine, optical coatings, tungsten filaments, and welding electrodes.

Exports of unspecified thorium compounds were 879 kilograms through July 2025 with a unit value of $291 per kilogram. Owing to variations in the type and purity of thorium compounds, the unit value of exports can vary widely by month and by exporting customs district.

Globally, monazite was produced primarily for its rare-earth-element content, and only a small fraction of the byproduct thorium was recovered and consumed. Thorium consumption worldwide is relatively small compared with that of most other mineral commodities. In international trade, China was the leading importer of monazite; Nigeria, Madagascar, Thailand, and Indonesia were China's leading import sources, in descending order of quantity.

Several companies and countries were active in the pursuit of commercializing a new generation of nuclear reactors that would use thorium as a fuel material. Thorium-based nuclear research and development programs have been or were underway in Australia, Belgium, Brazil, Canada, China, Czechia, Denmark, Finland, France, Germany, India, Israel, Italy, Japan, the Republic of Korea, the Netherlands, Norway, Russia, the United Kingdom, and the United States.

World Mine Production and Reserves:[6] Production and reserves are associated with the recovery of monazite in heavy-mineral-sand deposits. Without demand for the rare earths, monazite likely would not be recovered for its thorium content under current market conditions.

World Resources:[6] The world's leading thorium resources are found in placer, carbonatite, and vein-type deposits. Thorium is found in several minerals, including monazite, thorianite, and thorite. According to the World Nuclear Association,[7] worldwide identified thorium resources were an estimated 6.4 million tons of thorium. Thorium resources are found throughout the world, most notably in Australia, Brazil, India, and the United States. India has the largest resources (850,000 tons), followed by Brazil (630,000 tons), and Australia and the United States (600,000 tons each).

Substitutes: Nonradioactive substitutes have been developed for many applications of thorium. Yttrium compounds have replaced thorium compounds in incandescent lamp mantles. A magnesium alloy containing lanthanides, yttrium, and zirconium can substitute for magnesium-thorium alloys in aerospace applications. Cerium, lanthanum, yttrium, and zirconium oxides can substitute for thorium in welding electrodes. Several replacement materials (such as yttrium fluoride and proprietary materials) are in use as optical coatings instead of thorium fluoride.

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.
[1]Monazite may have been produced as a separate concentrate or included as an accessory mineral in heavy-mineral concentrates.
[2]Includes material that may have been misclassified.
[3]Defined as production + imports – exports. Production is only for ore and concentrates. Monazite is produced for the production of rare-earth compounds and not for thorium recovery. The apparent consumption calculation for thorium compounds results in a negative value for thorium compounds.
[4]Calculated from U.S. Census Bureau import data.
[5]Defined as imports – exports; however, a meaningful net import reliance could not be calculated owing to uncertainties in the classification of material being imported and exported.
[6]See Appendix C for resource and reserve definitions and information concerning data sources.
[7]Source: World Nuclear Association, 2017, Thorium: London, United Kingdom, World Nuclear Association, February.

TIN

(Data in metric tons, tin content, unless otherwise specified)

Domestic Production and Use: Tin has not been mined or smelted in the United States since 1993 or 1989, respectively. Twenty-five firms accounted for more than 94% of the primary tin consumed domestically in 2025. The uses for tin in the United States were chemicals, 25%; tinplate, 16%; alloys, 12%; solder, 11%; babbitt, brass and bronze, and tinning, 7%; bar tin, 2%; and other, 27%. In 2025, the estimated customs value of imported refined tin was $970 million, and the estimated value of tin recovered from old scrap domestically was $340 million based on the average S&P Global Platts Metals Week New York dealer price for tin.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production, secondary:[e]					
Old scrap	9,430	9,420	9,430	8,550	9,000
New scrap	7,600	7,900	7,900	8,000	8,000
Imports for consumption:					
Refined	38,100	33,200	28,200	25,400	32,000
Tin alloys, gross weight	1,110	735	901	731	1,200
Tin waste and scrap, gross weight	18,600	11,600	10,700	8,210	8,100
Exports:					
Refined	1,290	1,310	918	596	850
Tin alloys, gross weight	630	531	652	1,330	800
Tin waste and scrap, gross weight	2,800	30,300	38,000	13,400	4,500
Shipments from Government stockpile, gross weight[1]	437	—	NA	NA	NA
Consumption, apparent, refined[2]	48,000	41,200	35,000	34,600	43,000
Price, average, cents per pound:[3]					
New York dealer	1,580	1,546	1,256	1,420	1,600
London Metal Exchange (LME), cash	1,478	1,423	1,177	1,368	1,500
Stocks, consumer and dealer, yearend	9,030	9,180	10,900	9,600	8,100
Net import reliance[4] as a percentage of apparent consumption, refined tin	80	77	73	75	77

Recycling: About 17,000 tons of tin from old and new scrap was estimated to have been recycled in 2025. Of this, about 10,000 tons was recovered from old scrap at 1 detinning plant and 31 secondary nonferrous-metal-processing plants, accounting for 22% of apparent consumption.

Import Sources (2021–24): Refined tin: Peru, 31%; Bolivia, 27%; Indonesia, 15%; Brazil, 10%; and other, 17%. Waste and scrap: Canada, 91%; Mexico, 6%; and other, 3%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Unwrought tin:		
Tin, not alloyed	8001.10.0000	Free.
Tin alloys, containing, by weight:		
5% or less lead	8001.20.0010	Free.
More than 5% but not more than 25% lead	8001.20.0050	Free.
More than 25% lead	8001.20.0090	Free.
Tin waste and scrap	8002.00.0000	Free.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile:[5]

	FY 2025		**FY 2026**	
Material	**Potential acquisitions**	**Potential disposals**	**Potential acquisitions**	**Potential disposals**
Tin (gross weight)	—	640	NA	NA

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TIN

Events, Trends, and Issues: The estimated amount of new and old scrap tin recycled domestically in 2025 increased by 3% compared with that in 2024. The estimated annual average New York dealer price for refined tin in 2025 was 1,600 cents per pound, a 13% increase compared with that in 2024. The estimated annual average LME cash price for refined tin in 2025 was 1,500 cents per pound, a 10% increase compared with that in 2024. In March 2025, under section 232 of the Trade Expansion Act, the United States increased tariffs on imported aluminum products to 25%, aligning with existing 25% tariffs on steel products, and ended all previously existing country-specific exemptions. In June, the tariffs on both aluminum and steel products were raised to 50% for most countries, except for the United Kingdom, which remained at 25%. Steel products affected by these tariffs included varieties of tinplate with Harmonized Tariff Schedule of the United States codes 7210.11.0000, 7210.12.0000, and 7212.10.0000.

In 2025, a U.S. company with existing tin operations based in Coatesville, PA, advanced plans to establish a vertically integrated tin supply chain. In late 2024, the company was awarded $19 million from the U.S. Department of War under the Defense Production Act, Title III, to support the development of a domestic tin smelting, refining, and recycling facility. In May, the company signed a letter of intent with a Rwandan tin miner to secure feedstock supply, and in September began construction of a $65 million tin metal production and processing facility in Martinsville, VA. The Martinsville facility was expected to be operational by late 2026.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Brazil, Burma, Laos, Malaysia, Nigeria, and Vietnam based on company and Government reports. Reserves for Australia, Brazil, China, Congo (Kinshasa), Indonesia, and Peru were revised based on company and Government reports.

	Mine production		Reserves[6]
	2024	2025[e]	
United States	—	—	—
Australia	11,300	12,000	[7]570,000
Bolivia	21,200	15,000	400,000
Brazil	27,600	28,000	700,000
Burma	[e]20,000	12,000	700,000
China	[e]71,000	71,000	1,200,000
Congo (Kinshasa)	[e]26,000	27,000	91,000
Indonesia	[e]55,000	61,000	1,400,000
Laos	1,860	1,800	NA
Malaysia	5,460	5,000	NA
Nigeria	[e]3,100	3,500	NA
Peru	32,300	33,000	150,000
Russia	3,260	4,500	460,000
Rwanda	[e]4,100	4,600	NA
Vietnam	[e]11,000	11,000	23,000
Other countries	1,570	1,700	310,000
World total (rounded)	294,000	290,000	>6,000,000

World Resources:[6] Identified resources of tin in the United States, primarily in Alaska, were insignificant compared with those in the rest of the world. World resources, principally in western Africa, southeastern Asia, Australia, Bolivia, Brazil, Indonesia, and Russia, are extensive and, if developed, could sustain recent annual production rates well into the future.

Substitutes: Aluminum, glass, paper, plastic, or tin-free steel substitute for tin in cans and containers. Other materials that substitute for tin are epoxy resins for solder; aluminum alloys, alternative copper-base alloys, and plastics for bronze; plastics for bearing metals that contain tin; and compounds of lead and sodium for some tin chemicals.

[e]Estimated. NA Not available. — Zero.
[1]Defined as change in inventory from prior yearend inventory. If negative, increase in inventory. Beginning in 2023, Government stock changes no longer available.
[2]Defined for 2021–22 as production from old scrap + refined tin imports – refined tin exports ± adjustments for Government and industry stock changes. Beginning in 2023, Government stock changes no longer included.
[3]Source: S&P Global Platts Metals Week.
[4]Defined for 2021–22 as refined imports – refined exports ± adjustments for Government and industry stock changes. Beginning in 2023, Government stock changes no longer included.
[5]See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.
[6]See Appendix C for resource and reserve definitions and information concerning data sources.
[7]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 220,000 tons.

TITANIUM AND TITANIUM DIOXIDE[1]

(Data in metric tons unless otherwise specified)

Domestic Production and Use: The United States did not produce titanium sponge metal in 2025. The last domestic sponge plant closed in 2024. The facility was in Utah and had an estimated capacity of 500 tons per year of sponge that was further refined for use in electronics. A second sponge facility in Henderson, NV, with an estimated capacity of 12,600 tons per year has been idled since 2020 owing to market conditions. A third facility in Rowley, UT, with an estimated capacity of 10,900 tons per year has remained idle since 2016.

Although detailed 2025 consumption data were withheld to avoid disclosing proprietary data, the majority of titanium metal was used in aerospace applications, and the remainder was used in armor, chemical processing, marine hardware, medical implants, power generation, and other applications. The customs value of imported sponge was about $460 million, a 3% increase compared with $447 million in 2024.

In 2025, titanium dioxide (TiO_2) pigment production, by four companies operating five facilities in four States, was valued at an estimated $3 billion. The leading uses of TiO_2 pigment were, in descending order, paints (including lacquers and varnishes), plastics, and paper. Other uses of TiO_2 pigment included catalysts, ceramics, coated fabrics and textiles, floor coverings, printing ink, and roofing granules.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Titanium sponge metal:					
Production	W	W	W	W	—
Imports for consumption[e]	16,000	30,900	40,300	39,800	44,000
Exports	117	105	247	70	63
Consumption, apparent[2]	[3]15,900	[3]30,800	[3]40,100	[3]39,800	44,000
Consumption, reported	W	W	W	W	W
Price, dollars per kilogram[4]	11.10	11.10	12.30	13.30	12
Stocks, industry, yearend[e]	W	W	W	W	W
Employment, number[e]	20	20	20	10	—
Net import reliance[5] as a percentage of apparent consumption	>95	>95	>95	>95	100
TiO_2 pigment:					
Production	1,150,000	1,150,000	910,000	940,000	1,000,000
Imports for consumption	251,000	265,000	228,000	236,000	230,000
Exports	494,000	378,000	288,000	358,000	330,000
Consumption, apparent[2]	907,000	1,040,000	850,000	818,000	900,000
Price, dollars per metric ton[4]	2,920	3,450	3,240	3,170	3,200
Employment, number[e]	3,200	3,200	3,200	3,200	3,000
Net import reliance[5] as a percentage of apparent consumption	E	E	E	E	E

Recycling: Owing to limited responses from voluntary surveys, consumption data for titanium scrap metal for the titanium metal industry were withheld. Consumption data for titanium scrap for the steel, superalloy, and other industries were not available.

Import Sources (2021–24): Sponge metal: Japan, 77%; Saudi Arabia, 13%; Kazakhstan, 8%; and other, 2%. TiO_2 pigment: Canada, 45%; China, 11%; Germany, 7%; Mexico, 7%; and other, 30%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Titanium oxides (unfinished TiO_2 pigments)	2823.00.0000	5.5% ad valorem.
TiO_2 pigments, 80% or more TiO_2	3206.11.0000	6% ad valorem.
TiO_2 pigments, other	3206.19.0000	6% ad valorem.
Ferrotitanium and ferrosilicon titanium	7202.91.0000	3.7% ad valorem.
Unwrought titanium metal	8108.20.0000	15% ad valorem.
Titanium waste and scrap metal	8108.30.0000	Free.
Other titanium metal articles	8108.90.3000	5.5% ad valorem.
Wrought titanium metal	8108.90.6000	15% ad valorem.

Depletion Allowance: Not applicable.

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TITANIUM AND TITANIUM DIOXIDE

Government Stockpile:[6]

Material	FY 2025 Potential acquisitions	FY 2025 Potential disposals	FY 2026 Potential acquisitions	FY 2026 Potential disposals
Titanium	15,000	—	NA	NA
Titanium alloys	—	136	NA	NA

Events, Trends, and Issues: U.S. producers of titanium ingot and downstream products were reliant on imports of titanium sponge and scrap. U.S. imports of titanium sponge were an estimated 44,000 tons in 2025, exceeding the historical high of 40,300 tons imported in 2023. Japan (73%), Kazakhstan (13%), and Saudi Arabia (13%) were the leading import sources for titanium sponge in 2025 through July.

With funding support from the U.S. Government, a company in Virginia began commercial production of titanium powder from titanium scrap metal in late 2024. In 2025, the company was scaling up production capacity and aimed to achieve 1,400 tons per year in 2027 with potential for future expansion.

U.S. imports of titanium scrap were estimated to be 32,000 tons in 2025. The United Kingdom (19%), France and Japan (10% each), and Germany, the Republic of Korea, and Singapore (9% each), were the leading import sources for titanium waste and scrap in 2025 through July. Through July 2025, the average duty-paid unit value of scrap imports was about $7.70 per kilogram compared with the annual average price of $8.50 per kilogram in 2024.

Domestic production of TiO_2 pigment in 2025 was an estimated 1,000,000 tons. Although heavily reliant on imports of titanium mineral concentrates, the United States was a net exporter of TiO_2 pigments.

World Sponge Metal Production and Sponge and Pigment Capacity: Significant revisions were made to the 2024 sponge production for Kazakhstan and Russia based on company, Government, and news reports.

	Sponge production[e]		Capacity, 2025[e, 7]	
	2024	2025	Sponge	Pigment
United States	W	—	—	1,360,000
Australia	—	—	—	260,000
Canada	—	—	—	108,000
China	256,000	260,000	320,000	6,000,000
Germany	—	—	—	339,000
India	300	300	500	91,000
Japan	57,000	53,000	65,200	322,000
Kazakhstan	19,000	16,000	26,000	—
Mexico	—	—	—	350,000
Russia	33,000	25,000	46,500	55,000
Saudi Arabia	14,000	12,000	15,600	200,000
Ukraine	—	—	—	122,000
United Kingdom	—	—	—	165,000
Other countries	—	—	—	540,000
World total (rounded)	[8]380,000	370,000	470,000	9,900,000

World Resources:[9] Resources of titanium minerals are discussed in the Titanium Mineral Concentrates chapter.

Substitutes: Few materials possess titanium metal's strength-to-weight ratio and corrosion resistance. In high-strength applications, titanium competes with aluminum, composites, intermetallics, steel, and superalloys. Aluminum, nickel, specialty steels, and zirconium alloys may be substituted for titanium for applications that require corrosion resistance. Ground calcium carbonate, precipitated calcium carbonate, kaolin, and talc compete with TiO_2 as a white pigment.

[e]Estimated. E Net exporter. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.
[1]See also the Titanium Mineral Concentrates chapter.
[2]Defined as production + imports – exports.
[3]Excludes domestic production of sponge in Utah.
[4]Landed duty-paid value based on U.S. imports for consumption.
[5]Defined as imports – exports.
[6]See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.
[7]Yearend operating capacity.
[8]Excludes U.S. production.
[9]See Appendix C for resource and reserve definitions and information concerning data sources.

TITANIUM MINERAL CONCENTRATES[1]

[Data in thousand metric tons, titanium dioxide (TiO_2) content, unless otherwise specified]

Domestic Production and Use: In 2025, one company recovered ilmenite and rutile concentrates from its surface-mining operations near Nahunta, GA, and Starke, FL. A second company produced a mixed heavy-mineral concentrate from a mining operation in California. A third company began commercial production of ilmenite at a mine in Stony Creek, VA. Abrasive sands, monazite, and zircon were coproducts of domestic titanium minerals mining operations. Based on trade data through July, the estimated value of titanium mineral and synthetic concentrates imported into the United States in 2025 was $720 million. More than 95% of titanium mineral concentrates were consumed by domestic TiO_2 pigment producers. The remainder was used in welding-rod coatings and for manufacturing carbides, chemicals, and titanium metal.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production[2]	100	200	100	100	100
Imports for consumption	969	952	638	658	730
Exports, all forms[e]	20	110	40	5	10
Consumption, apparent[2, 3]	1,000	1,000	700	800	900
Price, dollars per metric ton:					
Rutile, bulk, minimum 95% TiO_2, free on board (f.o.b.) Australia[4]	1,300	1,470	1,460	1,300	1,140
Ilmenite and leucoxene, bulk, f.o.b. Australia[5]	595	530	389	497	400
Ilmenite, average unit value of imports[6]	240	285	365	330	300
Slag, 80%–95% TiO_2, average unit value of imports[6]	774	867	1,050	970	880
Employment, mine and mill, number	340	420	440	460	490
Net import reliance[7] as a percentage of apparent consumption	90	81	86	87	88

Recycling: None.

Import Sources (2021–24): South Africa, 26%; Canada, 16%; Madagascar, 16%; Mozambique, 13%; and other, 29%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Synthetic rutile	2614.00.3000	Free.
Ilmenite and ilmenite sand	2614.00.6020	Free.
Rutile concentrate	2614.00.6040	Free.
Titanium slag	2620.99.5000	Free.

Depletion Allowance: Ilmenite and rutile, 22% (domestic), 14% (foreign).

Government Stockpile: None.

Events, Trends, and Issues: Consumption of titanium mineral concentrates is closely tied to production of TiO_2 pigments that are primarily used in paint, paper, and plastics. Demand for these primary uses is related to changes in the gross domestic product. Although inventory changes were not included in the apparent consumption calculation, domestic apparent consumption of titanium mineral concentrates in 2025 was estimated to have increased 10% from that in 2024 owing mostly to an estimated 12% increase in imports.

As of July 2025, United States imports of titanium slag were predominantly from South Africa (65%), Norway (24%), and Canada (10%). Mozambique (44%), Madagascar (35%), Ukraine (11%), and Senegal (9%) were leading sources of ilmenite, and Australia (51%), South Africa (20%), Sierra Leone (18%), and Canada (11%) were the leading sources of rutile. Imports of synthetic rutile were predominantly from Sierra Leone (78%) and China (21%).

In 2025, China continued to be the leading producer and consumer of titanium mineral concentrates, accounting for approximately one-third of global production of ilmenite. Mozambique and South Africa were the second- and third-ranked producers of titanium mineral concentrates. China's imports of titanium mineral concentrates for the year through September were 3.8 million tons in gross weight, a 5% increase compared with those in the same period in 2024. Mozambique (47%), Australia (17%), and Norway (7%) were the leading sources of titanium mineral concentrates to China.

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TITANIUM MINERAL CONCENTRATES

World Mine Production and Reserves: Significant revisions were made to 2024 production for Australia, Madagascar, Sierra Leone, Ukraine, the United States, and "Other countries" based on company reports, Government reports, news, or trade data. Reserves for Australia, Canada, Kenya, South Africa, Ukraine, and "Other countries" were revised based on company and Government reports.

	Mine production[e]		Reserves[8]
	2024	2025	
Ilmenite:			
United States[2, 9]	100	100	2,000
Australia	600	780	[10]170,000
Canada[11]	360	360	50,000
China	3,040	3,200	110,000
India	230	240	15,000
Madagascar[11]	300	300	30,000
Mozambique	1,930	1,900	NA
Norway	432	390	37,000
Senegal	345	370	NA
South Africa[11]	1,260	1,300	28,000
Ukraine	286	200	5,900
Other countries	332	230	46,000
World total (ilmenite, rounded)[9]	9,210	9,400	>490,000
Rutile:			
United States	([9])	([9])	([9])
Australia	200	200	[10]35,000
India	12	13	670
Kenya	41	—	—
Mozambique	9	10	720
Sierra Leone	80	110	2,900
South Africa	102	100	6,200
Ukraine	9	10	2,500
Other countries	10	9	>540
World total (rutile, rounded)[9]	460	450	>49,000
World total (ilmenite and rutile, rounded)	9,680	9,800	>540,000

World Resources:[8] Ilmenite accounts for about 90% of the world's consumption of titanium minerals. World resources of anatase, ilmenite, and rutile total more than 2 billion tons.

Substitutes: Ilmenite, leucoxene, rutile, slag, and synthetic rutile compete as feedstock sources for producing TiO_2 pigment, titanium metal, and welding-rod coatings.

[e]Estimated. NA Not available. — Zero.
[1]See also the Titanium and Titanium Dioxide chapter.
[2]Rounded to the nearest 100,000 tons to avoid disclosing company proprietary data.
[3]Defined as production + imports – exports.
[4]Source: Fastmarkets IM; annual average.
[5]Source: Zen Innovations AG, Global Trade Tracker.
[6]Landed duty-paid unit value based on U.S. imports for consumption. Source: U.S. Census Bureau.
[7]Defined as imports – exports.
[8]See Appendix C for resource and reserve definitions and information concerning data sources.
[9]United States rutile production and reserves data are included with ilmenite.
[10]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were estimated to be 45 million tons for ilmenite and 12 million tons for rutile, respectively, TiO_2 content.
[11]Mine production of titaniferous magnetite is primarily used to produce titaniferous slag.

TUNGSTEN

(Data in metric tons, tungsten content, unless otherwise specified)

Domestic Production and Use: Tungsten has not been mined commercially in the United States since 2015. There were seven U.S. companies that have the capability to convert tungsten concentrates, ammonium paratungstate (APT), tungsten oxide, and (or) scrap to tungsten metal powder, tungsten carbide powder, and (or) tungsten chemicals. An estimated 60% of the tungsten consumed in the United States was used in cemented carbide parts for cutting and wear-resistant applications, primarily in the construction, metalworking, mining, and oil- and gas-drilling industries. The remainder was used to make various alloys and specialty steels; electrodes, filaments, wires, and other components for electrical, electronic, heating, lighting, and welding applications; and chemicals for various applications.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production:					
Mine	—	—	—	—	—
Secondary	W	W	W	W	W
Imports for consumption:					
Ores and concentrates	1,600	2,130	1,640	1,550	1,700
Other forms[1]	10,500	12,200	10,000	8,730	10,000
Exports:					
Ores and concentrates	441	614	1,510	1,410	1,400
Other forms[2]	2,970	3,680	3,180	3,480	3,300
Shipments from Government stockpile:[3]					
Concentrate	1,030	689	NA	NA	NA
Other forms	93	—	NA	NA	NA
Consumption:					
Reported, concentrate	W	W	W	W	W
Apparent,[4] all forms	W	W	W	W	W
Price,[5] concentrate, average in-warehouse Rotterdam, dollars per dry metric ton unit of tungsten trioxide[6]	225	275	258	252	380
Stocks, industry, concentrate and other forms, yearend	W	W	W	W	W
Net import reliance[7] as a percentage of apparent consumption	>50	>50	>50	>50	>50

Recycling: The estimated quantity of secondary tungsten produced and the amount consumed from secondary sources by processors and end users in 2025 were withheld to avoid disclosing company proprietary data.

Import Sources (2021–24): Ores, concentrates, and other forms:[1] China,[8] 26%; Germany, 14%; Bolivia, 8%; Vietnam, 8%; and other, 44%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Ores	2611.00.3000	Free.
Concentrates	2611.00.6000	37.5¢/kg on tungsten content.
Tungsten oxides	2825.90.3000	5.5% ad valorem.
Ammonium tungstates	2841.80.0010	5.5% ad valorem.
Tungsten carbides	2849.90.3000	5.5% ad valorem.
Ferrotungsten and ferrosilicon tungsten	7202.80.0000	5.6% ad valorem.
Tungsten powders	8101.10.0000	7% ad valorem.
Tungsten waste and scrap	8101.97.0000	2.8% ad valorem.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile:[9]

	FY 2025		FY 2026	
Material	Potential acquisitions	Potential disposals	Potential acquisitions	Potential disposals
Ores and concentrates	—	499	NA	NA
Tungsten	2,041	—	NA	NA

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TUNGSTEN

Events, Trends, and Issues: China continued to be the world's leading producer, importer, and consumer of tungsten concentrates. China's consumption and imports increased significantly in 2025. At the end of 2024, the United States, under section 301(b) of the Trade Act of 1974, increased tariffs to 50% on several tungsten products from China, and in February 2025 China implemented new export controls on selected tungsten items. As a result, prices rose sharply throughout 2025. Rotterdam prices increased from $266 to $551 per metric ton unit for 65% concentrate and from $331 to $675 per metric ton unit for APT. World mine production increased, especially from the start of production at the Boguty deposit in Kazakhstan. In Canada and the United States, multiple projects received awards under the Defense Production Act, Title III, including projects in Nevada, New Brunswick, and Yukon. In October, a joint venture between Kazakhstan and the United States to develop tungsten resources was announced.

World Mine Production and Reserves: Production in 2024 for Russia was revised significantly based on a Government report. Reserves for China and Vietnam were revised based on Government reports.

	Mine production[e]		Reserves[10]
	2024	2025	
United States	—	—	NA
Australia	920	1,000	[11]570,000
Austria	840	840	10,000
Bolivia	1,700	1,700	NA
China	67,000	67,000	2,500,000
Kazakhstan	—	2,400	NA
Korea, North	1,900	2,000	29,000
Portugal	650	700	3,400
Russia	1,500	2,000	400,000
Rwanda	1,300	1,300	NA
Spain	700	800	66,000
Vietnam	3,400	3,000	170,000
Other countries	1,700	2,400	950,000
World total (rounded)	82,000	85,000	>4,700,000

World Resources:[10] World tungsten resources are geographically widespread. China ranked first in the world in tungsten resources and reserves. Significant tungsten resources have been identified on every continent except Antarctica.

Substitutes: Potential substitutes for cemented tungsten carbides include cemented carbides based on molybdenum carbide, niobium carbide, or titanium carbide; ceramics; ceramic-metallic composites (cermets); and tool steels. Most of these options reduce rather than replace the amount of tungsten used. Potential substitutes for other applications are as follows: molybdenum for certain tungsten mill products; molybdenum steels for tungsten steels, although most molybdenum steels still contain tungsten; lighting based on carbon nanotube filaments, induction technology, and light-emitting diodes for lighting based on tungsten electrodes or filaments; depleted uranium or lead for tungsten or tungsten alloys in applications requiring high density or the ability to shield radiation; and depleted uranium alloys or hardened steel for cemented tungsten carbides or tungsten alloys in armor-piercing projectiles. In some applications, substitution would result in increased cost or a loss in product performance.

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.
[1]Includes ammonium and other tungstates; ferrotungsten; tungsten carbide powders; tungsten metal powders; tungsten oxides, chlorides, and other tungsten compounds; unwrought tungsten; wrought tungsten forms; and tungsten waste and scrap.
[2]Includes ammonium and other tungstates, ferrotungsten, tungsten carbide powders, tungsten metal powders, unwrought tungsten, wrought tungsten forms, and tungsten waste and scrap.
[3]Defined as change in total inventory from prior yearend inventory. If negative, increase in inventory. Beginning in 2023, Government stock changes no longer available.
[4]Defined for 2021–22 as mine production + secondary production + imports – exports ± adjustments for Government and industry stock changes. Beginning in 2023, Government stock changes no longer included.
[5]Source: Argus Media group, Argus Tungsten Analytics.
[6]A metric ton unit of tungsten trioxide contains 7.93 kilograms of tungsten.
[7]Defined for 2021–22 as imports – exports ± adjustments for Government and industry stock changes. Beginning in 2023, Government stock changes no longer included.
[8]Includes Hong Kong.
[9]See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.
[10]See Appendix C for resource and reserve definitions and information concerning data sources.
[11]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 220,000 tons.

VANADIUM

(Data in metric tons, vanadium content, unless otherwise specified)

Domestic Production and Use: Vanadium production in Utah from the mining of uraniferous sandstones on the Colorado Plateau ceased in early 2020 and was not restarted in 2025. Secondary vanadium production continued in Arkansas, Delaware, Ohio, Pennsylvania, and Texas, where processed waste materials (petroleum residues, spent catalysts, and utility ash) were used to produce ferrovanadium, vanadium-bearing chemicals or specialty alloys, and vanadium pentoxide. Estimated U.S. apparent consumption of vanadium in 2025 increased by 2% from that in 2024. Metallurgical use, primarily as an alloying agent for iron and steel, accounted for more than 90% of domestic reported vanadium consumption in 2025. Of the other uses for vanadium, the major nonmetallurgical use was in catalysts to produce maleic anhydride and sulfuric acid.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production from primary ore and concentrate	—	—	—	—	—
Production from ash, residues, and spent catalysts[e]	3,200	4,400	6,500	6,800	7,500
Imports for consumption:					
Aluminum-vanadium master alloy	35	104	221	67	10
Ash and residues[1, 2]	1,680	2,240	3,140	2,180	1,200
Ferrovanadium	2,170	2,650	2,330	1,820	2,200
Oxides and hydroxides, other	69	222	151	139	460
Vanadium chemicals[3]	846	722	430	528	560
Vanadium metal[4]	1	28	20	9	30
Vanadium ores and concentrates[1]	4	492	674	395	90
Vanadium pentoxide	1,710	1,980	2,320	2,360	1,800
Exports:					
Aluminum-vanadium master alloy	72	28	36	83	22
Ash and residues[1]	930	1,130	905	955	580
Ferrovanadium	173	154	159	68	10
Oxides and hydroxides, other	235	309	142	404	380
Vanadium metal[4]	4	8	38	3	2
Vanadium ores and concentrates[1]	81	185	160	17	20
Vanadium pentoxide	17	143	28	93	140
Consumption:					
Apparent[5]	8,200	10,900	14,300	12,700	13,000
Reported	8,030	7,510	[e]8,000	[e]8,500	9,000
Price, average, vanadium pentoxide,[6] dollars per pound	8.17	9.29	7.50	5.44	5.02
Stocks, yearend[7]	271	248	232	230	240
Net import reliance[8] as a percentage of apparent consumption	61	60	55	46	41

Recycling: Recycling of vanadium is mainly associated with reprocessing vanadium catalysts into new catalysts. The range in vanadium content in spent catalysts varies depending on the crude oil feedstock and the uncertainty associated with the quantity of vanadium recycled from spent chemical process catalysts was significant.

Import Sources (2021–24): Ferrovanadium: Canada, 50%; Austria, 35%; Russia, 6%; Latvia, 4%; and other, 5%. Vanadium pentoxide: Brazil, 47%; South Africa, 43%; Russia, 6%; and other, 4%. Total: Canada, 34%; Brazil, 13%; South Africa, 13%; Austria, 10%; and other, 30%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Vanadium ores and concentrates	2615.90.6090	Free.
Vanadium-bearing ash and residues	2620.40.0030	Free.
Vanadium-bearing ash and residues, other	2620.99.1000	Free.
Vanadium pentoxide, anhydride	2825.30.0010	5.5% ad valorem.
Vanadium oxides and hydroxides, other	2825.30.0050	5.5% ad valorem.
Ferrovanadium	7202.92.0000	4.2% ad valorem.
Vanadium metal	8112.92.7000	2% ad valorem.
Vanadium and articles thereof[9]	8112.99.2000	2% ad valorem.
Vanadium chemicals	([3])	5.5% ad valorem.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile: None.

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VANADIUM

Events, Trends, and Issues: The estimated average Chinese vanadium pentoxide (V_2O_5) price (98% V_2O_5 content) in 2025 was $5.02 per pound compared with $5.44 in 2024. The estimated United States ferrovanadium price (78% to 82% vanadium content) was $14.14 per pound in 2025 compared with $13.05 in 2024. Like most ferroalloys, vanadium is largely dependent on the market characteristics of the steel industry, particularly the Chinese steel sector, which plays a central role in global steel production. In 2025, China continued to be the world's top vanadium producer, with most of its production originating as a coproduct from vanadiferous titanomagnetite ores processed during steelmaking.

Executive Order 14257, effective April 5, 2025, established a 10% baseline reciprocal tariff on most imports, with higher rates for select countries. Executive Order 14323 increased tariffs from 10% to 50%, effective August 6, 2025, on many imports from Brazil, including high-purity vanadium products but not ferrovanadium. A major producer and supplier of vanadium in Brazil sought an exemption after experiencing delays and defaults on its high-purity vanadium contracts, citing the importance of its high-purity vanadium for U.S. aerospace and defense applications. Imports for the year were estimated based on data through July 2025 and may not fully reflect the effects of the tariffs.

Vanadium redox flow batteries (VRFBs) continued to be used in large-scale energy storage systems in 2025, owing to their operational safety, long cycle life, and suitability for medium- to long-duration use. Installations increased worldwide, supported by renewable energy growth and government policies. However, high capital costs and limited availability of high-purity vanadium feedstock remained key challenges. VRFBs also faced competition from a range of alternative battery chemistries being developed for similar grid-scale storage applications.

World Mine Production and Reserves: Production in 2024 for China was revised significantly based on a Government report. Reserves for Australia, Brazil, China, South Africa, and the United States were revised based on company and Government reports.

	Mine production		Reserves[10]
	2024	2025[e]	(thousand metric tons)
United States	—	—	50
Australia	—	—	[11]10,000
Brazil	5,190	5,300	94
China	[e]84,000	82,000	5,800
Russia	[e]21,000	21,000	5,000
South Africa	8,050	5,000	520
World total (rounded)	118,000	110,000	21,000

World Resources:[10] World resources of vanadium exceed 63 million tons. Vanadium occurs in deposits of phosphate rock, titaniferous magnetite, and uraniferous sandstone and siltstone, in which it constitutes less than 2% of the host rock. Significant quantities are also present in bauxite and carboniferous materials, such as coal, crude oil, oil shale, and tar sands. Because vanadium is typically recovered as a byproduct or coproduct, demonstrated world resources of the element are not fully indicative of available supplies.

Substitutes: Steels containing various combinations of other alloying elements can be substituted for steels containing vanadium. Certain metals, such as manganese, molybdenum, niobium (columbium), titanium, and tungsten, are to some degree interchangeable with vanadium as alloying elements in steel. Platinum and nickel can replace vanadium compounds as catalysts in some chemical processes. Currently, no acceptable substitute for vanadium is available for use in aerospace titanium alloys.

[e]Estimated. — Zero.
[1]Reported by the U.S. Census Bureau as kilograms of V_2O_5. To convert V_2O_5 content to vanadium content, multiply by 0.56.
[2]Includes estimates for data suppressed by the U.S. Census Bureau in the years 2021 through 2025.
[3]Includes Harmonized Tariff Schedule of the United States codes for chloride oxides and hydroxides of vanadium (2827.49.1000), hydrides and nitrides of vanadium (2850.00.2000), vanadates (2841.90.1000), vanadium chlorides (2827.39.1000), and vanadium sulfates (2833.29.3000).
[4]Includes waste and scrap.
[5]Defined as primary production + secondary production + imports – exports ± adjustments for industry stock changes.
[6]Chinese annual average V_2O_5 prices (98% V_2O_5 content). Source: Argus Media, Argus Non-Ferrous Markets.
[7]Includes ferrovanadium, vanadium-aluminum alloy, other vanadium alloys, vanadium metal, vanadium pentoxide, and other specialty chemicals.
[8]Defined as imports – exports ± adjustments for industry stock changes.
[9]Aluminum-vanadium master alloy consisting of 35% aluminum and 64.5% vanadium and is the main master alloy for the vanadium industry. Unwrought aluminum-vanadium master alloy (Harmonized Tariff Schedule of the United States code 7601.20.9030) was not included.
[10]See Appendix C for resource and reserve definitions and information concerning data sources.
[11]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 2.3 million tons.

VERMICULITE

(Data in thousand metric tons unless otherwise specified)

Domestic Production and Use: Two companies with mining and processing facilities in South Carolina and Virginia produced approximately 100,000 tons of vermiculite concentrate; data have been rounded to the nearest hundred thousand tons to avoid disclosing company proprietary data. Most vermiculite concentrate, whether produced in the United States or imported, was shipped to 12 exfoliating plants operated by 10 companies in seven States. The end uses for exfoliated vermiculite were estimated to be agriculture, 30%; lightweight concrete aggregates (including cement premixes, concrete, and plaster), 16%; insulation, 15%; and other, 39%.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production[1, 2]	100	100	100	100	100
Imports for consumption[e]	32	24	50	40	38
Exports[e]	10	8	8	8	5
Consumption:					
Apparent, concentrate[e, 3]	120	120	140	130	130
Reported, exfoliated	68	67	59	59	55
Price, range of value, concentrate, ex-plant, dollars per metric ton	NA	NA	NA	NA	NA
Employment, number[e]	70	70	70	70	70
Net import reliance[4] as a percentage of apparent consumption[e]	18	14	30	24	25

Recycling: Insignificant.

Import Sources (2021–24): South Africa, 46%; Brazil, 43%; Zimbabwe, 6%; Uganda, 5%; and other, <1%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Vermiculite, perlite, and chlorites, unexpanded	2530.10.0000	Free.
Exfoliated vermiculite, expanded clays, foamed slag, and similar expanded materials	6806.20.0000	Free.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Trade data for vermiculite concentrate are collected within the group “vermiculite, perlite and chlorites, unexpanded” by the U.S. Census Bureau. Domestic exports and imports for consumption of vermiculite were estimated based on information published by the U.S. Census Bureau and adjusted by the U.S. Geological Survey based on average unit value, countries known to produce vermiculite, and likely port destinations to eliminate other minerals reported in the same group. United States imports were an estimated 38,000 tons in 2025, compared with an estimated 40,000 tons in 2024. In 2025, most imports came from Brazil and South Africa.

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VERMICULITE

Global vermiculite production was estimated to be 460,000 tons in 2025. South Africa produced an estimated 160,000 tons of vermiculite, which accounted for 35% of the global production. The United States and Brazil produced an estimated 100,000 tons (22%) and 50,000 tons (11%), respectively. The remaining 32% of global production was from nine countries.

World Mine Production and Reserves:

	Mine production		Reserves[5]
	2024	2025[e]	
United States	[1, 2]100	[1, 2]100	25,000
Brazil	[e]53	50	6,600
Bulgaria	[e]10	10	NA
China	[e]39	40	2,900
India	[e]2	2	1,600
Mexico	([6])	([6])	NA
Russia	37	40	NA
South Africa	163	160	14,000
Turkey	13	10	11,000
Uganda	[e]24	20	NA
Uzbekistan	[e]1	1	NA
Zimbabwe	[e]28	30	NA
World total (rounded)	470	460	NA

World Resources:[5] In addition to the producing mines in South Carolina and Virginia, there are vermiculite occurrences in Colorado, Nevada, North Carolina, Texas, and Wyoming that contain estimated resources of 2 million to 3 million tons. Significant deposits have been reported in Australia, Russia, Uganda, and some other countries, but reserve and resource information comes from many sources, and in most cases, it is not clear whether the numbers refer to vermiculite alone or vermiculite plus other minerals and host rock and overburden.

Substitutes: Expanded perlite is a substitute for exfoliated vermiculite in lightweight concrete and plaster. Other denser but less costly alternatives in these applications include expanded clay, shale, slag, and slate. Alternate materials for loose-fill fireproofing insulation include fiberglass, perlite, and slag wool. In agriculture, substitutes include bark and other plant materials, peat, perlite, sawdust, and synthetic soil conditioners.

[e]Estimated. NA Not available.
[1]Concentrate sold or used by producers.
[2]Data are rounded to the nearest hundred thousand tons to avoid disclosing company proprietary data.
[3]Defined as concentrate sold or used by producers + imports – exports.
[4]Defined as imports – exports.
[5]See Appendix C for resource and reserve definitions and information concerning data sources.
[6]Less than ½ unit.

WOLLASTONITE

(Data in metric tons unless otherwise specified)

Domestic Production and Use: Wollastonite was mined by two companies in New York during 2025. U.S. production of wollastonite (sold or used by producers) was withheld to avoid disclosing company proprietary data but was estimated to have increased by 14% from that in 2024. Economic resources of wollastonite typically form because of thermal metamorphism of siliceous limestone during regional deformation or chemical alteration of limestone by siliceous hydrothermal fluids along faults or contacts with magmatic intrusions. Deposits of wollastonite have been identified in Arizona, California, Idaho, Nevada, New Mexico, New York, and Utah; however, New York is the only State where long-term continuous mining has taken place.

Ceramics (frits, sanitaryware, and tile), friction products (primarily brake linings), metallurgical applications (flux and conditioner), paint (architectural and industrial paints), plastics and rubber markets (thermoplastic and thermoset resins and elastomer compounds), and miscellaneous uses (including adhesives, concrete, glass, and sealants) accounted for wollastonite sales in the United States.

In ceramics, wollastonite decreases shrinkage and gas evolution during firing; increases green and fired strength; maintains brightness during firing; permits fast firing; and reduces cracking, crazing, and glaze defects. In metallurgical applications, wollastonite serves as a flux for welding, a source of calcium oxide, a slag conditioner, and protects the surface of molten metal during the continuous casting of steel. As an additive in paint, it improves the durability of the paint film, acts as a pH buffer, improves resistance to weathering, reduces gloss and pigment consumption, and acts as a flatting and suspending agent. In plastics, wollastonite improves tensile and flexural strength, reduces resin consumption, and improves thermal and dimensional stability at elevated temperatures. Surface treatments are used to improve the adhesion between wollastonite and the polymers to which it is added. As a substitute for asbestos in floor tiles, friction products, insulating board and panels, paint, plastics, and roofing products, wollastonite is resistant to chemical attack, stable at high temperatures, and improves flexural and tensile strength.

Salient Statistics—United States: The United States was a net exporter of wollastonite in 2025. Comprehensive trade data were not available for wollastonite because it is imported and exported under a generic Harmonized Tariff Schedule of the United States code and Schedule B number, respectively, that include multiple mineral commodities. Price data for wollastonite were unavailable. Products with finer grain sizes and acicular (highly elongated) particles sold for higher prices. Surface treatment, when necessary, also increased the selling price. Approximately 68 people were employed at wollastonite mines and mills in 2025 (excluding office workers) in the United States.

Recycling: None.

Import Sources (2021–24): Comprehensive trade data were not available, but wollastonite was primarily imported from China and India.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Mineral substances not elsewhere specified or included	2530.90.8050	Free.

Depletion Allowance: 10% (domestic and foreign).

Government Stockpile: None.

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WOLLASTONITE

Events, Trends, and Issues: In March 2024, the U.S. Environmental Protection Agency (EPA) issued a final rule[1] that prohibited the commercial use, distribution in commerce, import, manufacturing, and processing of chrysotile for all asbestos-containing products that are still used in the United States: aftermarket automotive brakes and linings and other vehicle friction products, diaphragms used in the chloralkali industry, oilfield brake blocks, and sheet and other gaskets. The EPA ordered most uses of asbestos phased out from 6 months to 2 years after November 25, 2024, the effective date of the rule. This could lead to greater use of wollastonite in brake and friction products as a substitute for asbestos.

The production of motor vehicles, which contain wollastonite in friction products and plastic and rubber components, was approximately 15.5 million vehicles during 2024, and production was expected to remain at the same level in 2025. Construction starts of new housing units through August 2025 decreased by 5% compared with those during the same period in 2024. Sales of wollastonite for domestic construction-related markets, such as adhesives, caulks, cement board, ceramic tile, paints, stucco, and wallboard were estimated to have decreased. Sales of wollastonite were estimated to be slightly lower for crude steel production, which was 79.5 million tons during 2024 and was estimated to have decreased to 78 million tons during 2025.

Globally, ceramics, paint, and polymers (such as plastics and rubber) accounted for most wollastonite sales. Lesser global uses for wollastonite included miscellaneous construction products, friction materials, metallurgical applications, and paper.

World Mine Production and Reserves: Mine production data for China, Finland, and Mexico were revised based on company and Government reports. More countries than those listed may produce wollastonite; however, many countries do not publish wollastonite production data.

	Mine production[e]		Reserves[2]
	2024	2025	
United States	W	W	World resources of wollastonite were estimated to exceed 100 million tons. Many deposits have been identified but have not been surveyed sufficiently to quantify their reserves.
Canada	20,000	30,000	
China	600,000	600,000	
India	115,000	120,000	
Mexico	112,000	100,000	
Other countries	11,000	11,000	
World total (rounded)[3]	858,000	860,000	

World Resources:[2] Reliable estimates of wollastonite resources do not exist for most countries. Large deposits of wollastonite have been identified in China, Finland, India, Mexico, and the United States. Smaller, but significant, deposits have been identified in Canada, Chile, Kenya, Namibia, South Africa, Spain, Sudan, Tajikistan, Turkey, and Uzbekistan.

Substitutes: Wollastonite's acicular nature allows it to compete with other acicular materials, such as ceramic fiber, glass fiber, steel fiber, and several organic fibers, such as aramid, polyethylene, polypropylene, and polytetrafluoroethylene, in products where improvements in dimensional stability, flexural modulus, and heat deflection are sought. Wollastonite also competes with several nonfibrous minerals, such as kaolin, mica, and talc, which are added to plastics to increase flexural strength, and such minerals as barite, calcium carbonate, gypsum, and talc, which impart dimensional stability to plastics. In ceramics, wollastonite competes with carbonates, feldspar, lime, and silica as a source of calcium and silica. Its use in ceramics depends on the formulation of the ceramic body and the firing method.

[e]Estimated. W Withheld to avoid disclosing company proprietary data.
[1]Source: U.S. Environmental Protection Agency, 2024, Asbestos Part 1; Chrysotile Asbestos; Regulation of Certain Conditions of Use Under the Toxic Substances Control Act (TSCA): Federal Register, v. 89, no. 61, March 28, p. 21970–22010. (Accessed September 29, 2025, at https://www.govinfo.gov/content/pkg/FR-2024-03-28/pdf/2024-05972.pdf.)
[2]See Appendix C for resource and reserve definitions and information concerning data sources.
[3]Excludes U.S. production.

YTTRIUM[1]

[Data in metric tons, yttrium oxide (Y_2O_3) equivalent, unless otherwise specified]

Domestic Production and Use: Yttrium is one of the rare-earth elements. Bastnaesite was mined as the primary rare-earth source at the Mountain Pass Mine in California. Yttrium was estimated to represent about 0.12% of the rare-earth elements in the Mountain Pass bastnaesite ore, but its production content was not reported. Monazite concentrates containing yttrium-rich xenotime were produced from heavy-mineral-sand operations in Florida. There were no fully commercial facilities in the United States that could separate or refine yttrium.

The leading domestic and global end uses of yttrium were in ceramics and phosphors. Lesser amounts were consumed for fiber optics, optical glass, pigments and other applications, including yttrium-aluminum-garnet crystals used in lasers for communication, industrial, and medical applications.

Salient Statistics—United States:	**2021**	**2022**	**2023**	**2024**	**2025[e]**
Production, mine	NA	NA	NA	NA	NA
Imports for consumption, yttrium, alloys, compounds, and metal[e, 2]	560	818	323	457	300
Exports, compounds[e, 3]	9	4	20	[4]3	[4]12
Consumption, apparent[e, 5]	700	1,000	200	500	300
Price, average, dollars per kilogram:[6]					
Y_2O_3, minimum 99.999% purity	6	12	8	6	9
Yttrium metal, minimum 99.9% purity	39	41	33	33	40
Net import reliance[7, 8] as a percentage of apparent consumption	100	100	100	100	100

Recycling: Insignificant.

Import Sources (2021–24):[2] Although there were no domestic trade codes for yttrium materials exclusively, shipping records indicated imported yttrium alloys, compounds, and metals were from China,[9] 70%; Germany, 11%; Austria, 8%; Republic of Korea, 4%; and other, 7%. Nearly all imports of yttrium metal and compounds were derived from mineral concentrates processed in China. Import sources do not include yttrium contained in value-added intermediates and finished products.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–25**
Rare-earth metals, unspecified:		
Not alloyed	2805.30.0050	5% ad valorem.
Alloyed	2805.30.0090	5% ad valorem.
Mixtures of rare-earth oxides containing yttrium or scandium as the predominant metal	2846.90.2015	Free.
Mixtures of rare-earth chlorides containing yttrium or scandium as the predominant metal	2846.90.2082	Free.
Yttrium-bearing materials and compounds containing by weight >19% to <85% Y_2O_3	2846.90.4000	Free.
Other rare-earth compounds, including yttrium and other compounds	2846.90.8090	3.7% ad valorem.

Depletion Allowance: Monazite, thorium content, 22% (domestic), 14% (foreign); yttrium, rare-earth content, 14% (domestic and foreign); and xenotime, 14% (domestic and foreign).

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YTTRIUM

Government Stockpile: Not available.

Events, Trends, and Issues: In April 2025, China tightened its export controls on rare-earth elements, adding specific controls on yttrium metals, oxides, alloys, and compounds. In November, the United States stated that China will issue general licenses for rare-earth exports, effectively eliminating the controls introduced in April. As of December 2025, the April export controls remained in effect, although China began to issue general export licenses to selected exporters.

The average price for Y_2O_3 increased by 42% and the average price for yttrium metal increased by 22% compared with prices in 2024. China exported an estimated 1,600 tons (Y_2O_3 equivalent) of yttrium compounds and metal in 2025, and the leading export destinations were, in descending order of quantity, Japan, the Republic of Korea, the United States, and Germany.

World Mine Production and Reserves:[10] The U.S. Geological Survey (USGS) estimated that 2025 world mine production of Y_2O_3 equivalent contained in rare-earth mineral concentrates was 10,000 to 15,000 tons. The USGS estimated that China produced most of the world supply of yttrium in 2025; however, China's Ministry of Industry and Information Technology did not release public information on 2025 quotas for rare-earth mining and separation. Additionally, the USGS estimated that Burma produced a significant percentage of the estimated world supply of yttrium in 2025.

Global reserves of Y_2O_3 were not quantified; however, the leading countries for total rare-earth-oxide reserves included Australia, Brazil, China, Russia, and Vietnam. Although mined rare earth production in Burma, India, Madagascar, Malaysia, Nigeria, and Thailand was significant, reliable information on yttrium reserves was not available.

World Resources:[10] Large resources of yttrium in monazite and xenotime are available worldwide in placer deposits, carbonatites, uranium ores, and weathered clay deposits (ion-adsorption ore). Additional resources of yttrium occur in apatite-magnetite-bearing rocks, deposits of niobium-tantalum minerals, non-placer monazite-bearing deposits, sedimentary phosphate deposits, and uranium ores.

Substitutes: Substitutes for yttrium are available for some applications but generally are much less effective. In most uses, especially in electronics, lasers, and phosphors, yttrium is generally not subject to direct substitution by other elements. As a stabilizer in zirconia ceramics, Y_2O_3 may be substituted with calcium oxide or magnesium oxide, but the substitutes generally impart lower toughness.

[e]Estimated. NA Not available.
[1]See also the Rare Earths chapter; trade data for yttrium are included in the data shown for rare earths.
[2]Estimated from Trade Mining LLC shipping records.
[3]Includes data for the following Schedule B number: 2846.90.2015.
[4]Data adjusted by the U.S. Geological Survey to exclude low-value shipments. The U.S. Census Bureau reported 1,300 metric tons of exports in 2024 and 630 metric tons of exports through July 2025.
[5]Defined as imports – exports. Rounded to one significant digit. Yttrium consumed domestically was imported or refined from imported materials.
[6]Free on board China. Source: Argus Media group, Argus Rare Earths.
[7]Defined as imports – exports.
[8]Domestic production of mineral concentrates was stockpiled or exported. Consumers of compounds and metals were reliant on imports and stockpiled inventory of compounds and metals.
[9]Includes Hong Kong.
[10]See Appendix C for resource and reserve definitions and information concerning data sources.

ZEOLITES (NATURAL)

(Data in metric tons unless otherwise specified)

Domestic Production and Use: In 2025, seven companies operated seven zeolite mines in six States and produced an estimated 80,000 tons of natural zeolites. Total production increased by 4% compared with that in 2024. Chabazite was mined in Arizona and clinoptilolite was mined in California, Idaho, New Mexico, Oregon, and Texas. Small quantities of erionite, ferrierite, mordenite, and phillipsite were also likely produced.

An estimated 77,000 tons of natural zeolites were sold in the United States during 2025, 4% more than the sales in 2024. Domestic uses were, in descending order of estimated quantity, animal feed, odor control, unspecified end uses (such as ice melt, soil amendment, and synthetic turf), water purification, pet litter, wastewater treatment, oil and grease absorbent, fertilizer carrier, gas absorbent, aquaculture, desiccant, fungicide or pesticide carrier, and catalyst. Animal feed and odor control accounted for 42% and 15%, respectively, of the domestic sales tonnage.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production, mine	[e]87,000	77,400	[e]74,300	[e]76,900	80,000
Sales, mill	[e]74,000	79,800	[e]71,900	[e]73,800	77,000
Imports for consumption[e]	<1,000	<1,000	<1,000	<1,000	<1,000
Exports[e]	<1,000	<1,000	<1,000	<1,000	<1,000
Consumption, apparent[1]	74,000	79,800	71,900	73,800	77,000
Price, range of value, dollars per metric ton[e, 2]	50–300	50–300	50–300	50–300	50–300
Employment, mine and mill, number[e, 3]	120	130	130	120	120
Net import reliance[4] as a percentage of apparent consumption	E	E	E	E	E

Recycling: Zeolites used for desiccation, gas absorbance, wastewater treatment, and water purification may be reused after reprocessing of the spent zeolites. Information about the quantity of recycled natural zeolites was unavailable.

Import Sources (2021–24): Comprehensive trade data were not available for natural zeolite minerals because they were imported and exported under a generic Harmonized Tariff Schedule of the United States code and Schedule B number, respectively, that include multiple mineral commodities or under codes for finished products. Nearly all imports and exports were estimated to be synthetic zeolites.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Mineral substances not elsewhere specified or included	2530.90.8050	Free.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Production and sales of natural zeolites have nearly doubled from 1995 through 2025 owing to increased sales for animal feed, odor control, soil amendment, and water purification applications. Domestic production and sales of natural zeolite products have fluctuated in recent years. Natural zeolite sales increased for the second year in a row after reaching a 7-year low in 2023. Sales and production have varied because of competition from clays and synthetic zeolites and a shift from traditional markets, such as pet litter, to newer markets including traction control, soil amendment, and artificial turf infill.

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ZEOLITES (NATURAL)

World Mine Production and Reserves: Many countries either do not report production of natural zeolites, report zeolites as part of a pooled group of mineral commodities often listed as “other,” or report production with a delay of 2 to 3 years. In countries that mine large tonnages of zeolite minerals, end uses typically include low-value, high-volume construction applications, such as dimension stone, lightweight aggregate, and pozzolanic cement. As a result, production data for some countries may not be comparable to U.S. production data, which are the quantities of natural zeolites used in high-value applications. Significant revisions to 2024 production for Cuba, Georgia, and Russia were made based on company and Government reports, while New Zealand was removed as a producer for the same reason.

World reserves of natural zeolites have not been estimated. Deposits occur in many countries, but companies rarely publish reserves data. Estimating reserves is further complicated because much of the reported world production includes altered volcanic tuffs with low to moderate concentrations of zeolites that are typically used in high-volume construction applications. Some deposits should, therefore, be excluded from reserves estimates because it is the rock itself and not its zeolite content that makes these deposits valuable.

	Mine production		Reserves[5]
	2024	2025[e]	
United States	[e]76,900	80,000	Two of the leading companies in the United States reported combined reserves of 80 million tons in 2022; total U.S. reserves likely were substantially larger. World data were unavailable, but reserves were estimated to be large.
Chile	[e]500	240	
China	[e]150,000	150,000	
Cuba	14,900	15,000	
Georgia	243,000	240,000	
Hungary	[e]30,000	31,000	
Indonesia	[e]120,000	120,000	
Jordan	[e]1,000	1,000	
Korea, Republic of	[e]140,000	160,000	
Philippines	6,320	6,300	
Russia	[e]130,000	130,000	
Slovakia	273,000	280,000	
Turkey	57,100	58,000	
World total (rounded)	1,240,000	1,300,000	

World Resources:[5] Recent estimates for domestic and global resources of natural zeolites are not available. Resources of chabazite and clinoptilolite in the United States are sufficient to satisfy foreseeable domestic demand.

Substitutes: For pet litter, zeolites compete with other mineral-based litters, such as those manufactured using bentonite, diatomite, fuller’s earth, and sepiolite; organic litters made from shredded corn stalks and paper, straw, and wood shavings; and litters made using silica gel. Diatomite, perlite, pumice, vermiculite, and volcanic tuff compete with natural zeolites as lightweight aggregate. Zeolite desiccants compete against such products as magnesium perchlorate and silica gel. Zeolites compete with bentonite, gypsum, montmorillonite, peat, perlite, silica sand, and vermiculite in various soil amendment applications. Activated carbon, diatomite, or silica sand may substitute for zeolites in water-purification applications. As an oil absorbent, zeolites compete mainly with bentonite, diatomite, fuller’s earth, sepiolite, and a variety of polymer and natural organic products. In animal feed, zeolites compete with bentonite, diatomite, fuller’s earth, kaolin, silica, and talc as anticaking and flow-control agents.

[e]Estimated. E Net exporter.
[1]Defined as mill sales + imports – exports. Information about industry stocks was unavailable.
[2]Range of ex-works mine and mill unit values for individual natural zeolite operations, based on data reported by U.S. producers and on U.S. Geological Survey estimates. Average unit values per metric ton were an estimated $125 in 2021, $167 in 2022, $157 in 2023, and $200 in 2024. Prices vary with the percentage of zeolite present in the product, the chemical and physical properties of the zeolite mineral(s), particle size, surface modification and (or) activation, and end use.
[3]Excludes administration and offsite office staff. Estimates based on data from the Mine Safety and Health Administration.
[4]Defined as imports – exports.
[5]See Appendix C for resource and reserve definitions and information concerning data sources.

ZINC

(Data in thousand metric tons, zinc content, unless otherwise specified)

Domestic Production and Use: The estimated value of zinc mined in 2025 was $2.2 billion. Zinc was mined in five States at six mining operations by five companies. Two smelter facilities, one primary and one secondary, operated by two companies, accounted for most of the commercial-grade zinc metal produced in the United States. Of the total reported zinc consumed, most was used to produce galvanized steel, followed by brass and bronze, zinc-base alloys, and other uses.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production:					
Mine, zinc in concentrates	704	766	766	759	670
Refined zinc[e, 1]	220	220	220	220	220
Imports for consumption:					
Ores and concentrates	13	5	18	18	20
Refined zinc	701	762	705	590	600
Exports:					
Ores and concentrates	644	644	641	660	630
Refined zinc	13	8	3	2	2
Shipments from Government stockpile[2]	—	1	NA	NA	NA
Consumption, apparent, refined zinc[3]	908	974	921	808	820
Price, average, cents per pound:					
North American[4]	145.8	190.2	151.3	144.2	149
London Metal Exchange (LME), cash	136.3	158.1	120.1	126.0	130
Stocks, reported producer and consumer, refined zinc, yearend	114	133	105	110	110
Employment, number:					
Mine and mill[5]	2,480	2,500	2,630	2,510	2,600
Smelter, primary	220	220	340	340	340
Net import reliance[6] as a percentage of apparent consumption:					
Ores and concentrates	E	E	E	E	E
Refined zinc	76	77	76	73	73

Recycling: Refined zinc produced in the United States was recovered from secondary materials at both primary and secondary smelters. These secondary materials included galvanizing residues and crude zinc oxide recovered from electric arc furnace dust.

Import Sources (2021–24): Ores and concentrates: Peru, 50%; Canada, 19%; Turkey, 18%; Republic of Korea, 7%; and other, 6%. Refined metal: Canada, 57%; Mexico, 15%; Peru, 8%; Republic of Korea, 7%; and other, 13%. Waste and scrap (gross weight): Canada, 64%; Mexico, 33%; and other, 3%. Combined total (includes gross weight of waste and scrap): Canada, 56%; Mexico, 15%; Peru, 9%; Republic of Korea, 7%; and other, 13%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Zinc ores and concentrates, zinc content	2608.00.0030	Free.
Zinc oxide; zinc peroxide	2817.00.0000	Free.
Zinc sulfate	2833.29.4500	1.6% ad valorem.
Unwrought zinc, not alloyed:		
Containing 99.99% or more zinc	7901.11.0000	1.5% ad valorem.
Containing less than 99.99% zinc:		
Casting-grade	7901.12.1000	3% ad valorem.
Other	7901.12.5000	1.5% ad valorem.
Zinc alloys	7901.20.0000	3% ad valorem.
Zinc waste and scrap	7902.00.0000	Free.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile:[7]

	FY 2025		FY 2026	
Material	Potential acquisitions	Potential disposals	Potential acquisitions	Potential disposals
Zinc	—	2.27	NA	NA

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ZINC

Events, Trends, and Issues: U.S. zinc mine production was estimated to have decreased by 12% in 2025 compared with that in 2024, mostly owing to a decrease in production at the Red Dog Mine in Alaska owing to lower ore grades as the operation approached the end of its mine life. Operations at the Middle Tennessee zinc mines have been suspended since November 2023. During the closure, drilling work was conducted to define additional zinc, germanium, and gallium resources. Development advanced for several domestic zinc mine projects, including the restart of the Bunker Hill Mine in Idaho and the opening of the Hermosa project in Arizona. Domestic refined production was estimated to have remained essentially unchanged in 2025 compared with that in 2024, and apparent consumption increased slightly alongside an estimated increase in net imports of refined zinc. Galvanized steel was the leading use of refined zinc in the United States, which was used widely in the automobile and construction end markets.

The annual average LME cash price for Special High Grade (SHG) zinc was projected to increase by 3% in 2025 from that in 2024. After decreasing in 2024 and 2023, the annual average North American premium to the LME cash price was projected to increase in 2025 by 6%. According to the International Lead and Zinc Study Group,[8] estimated global refined zinc production in 2025 was forecast to increase slightly to 13.8 million tons mostly owing to the commissioning of a significant amount of refining capacity in China, and estimated metal consumption was forecast to increase slightly to 13.7 million tons, resulting in a production-to-consumption surplus of 85,000 tons.

World Mine Production and Reserves: Reserves for China, India, Kazakhstan, Peru, Sweden, and the United States were revised based on company and Government reports.

	Mine production[9]		Reserves[10]
	2024	2025[e]	
United States	759	670	9,300
Australia	1,100	1,100	[11]64,000
Bolivia	512	500	NA
China	4,000	4,100	60,000
India	[e]870	870	10,000
Kazakhstan	[e]380	360	7,400
Mexico	773	780	14,000
Peru	1,270	1,500	18,000
Russia	[e]310	430	29,000
Sweden	239	230	4,100
Other countries	1,730	2,000	25,000
World total (rounded)	11,900	13,000	240,000

World Resources:[10] Identified zinc resources of the world are about 1.9 billion tons.

Substitutes: Aluminum and plastics substitute for galvanized sheet in automobiles; aluminum alloys, cadmium, paint, and plastic coatings replace zinc coatings in other applications. Aluminum- and magnesium-base alloys are major substitutes for zinc-base diecasting alloys. Many elements are substitutes for zinc in chemical, electronic, and pigment uses.

[e]Estimated. E Net exporter. NA Not available. — Zero.
[1]Includes primary and secondary zinc metal production.
[2]Defined as changes in total inventory from prior yearend inventory. If negative, increase in inventory. Beginning in 2023, Government stock changes no longer available.
[3]Defined for 2021–22 as refined production + refined imports – refined exports ± adjustments for Government stock changes. Beginning in 2023, Government stock changes no longer included.
[4]Source: S&P Global Platts Metals Week, North American SHG zinc; based on the LME cash price plus premium.
[5]Includes mine and mill employment at zinc-containing deposits. Excludes office workers. Source: Mine Safety and Health Administration.
[6]Defined for 2021–22 as imports – exports ± adjustments for Government stock changes. Beginning in 2023, Government stock changes no longer included.
[7]See Appendix B for definitions. For fiscal year 2026, the Annual Materials Plan was not released.
[8]Source: International Lead and Zinc Study Group, 2025, ILZSG session/forecasts: Lisbon, Portugal, International Lead and Zinc Study Group press release, October 13, [4] p.
[9]Zinc content of concentrates and direct shipping ores.
[10]See Appendix C for resource and reserve definitions and information concerning data sources.
[11]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 19 million tons.

ZIRCONIUM AND HAFNIUM

(Data in metric tons unless otherwise specified)

Domestic Production and Use: In 2025, one company recovered zircon (zirconium silicate) from surface-mining operations in Florida and Georgia as a coproduct from the mining of heavy-mineral sands, and a second company processed existing mineral sands tailings in California. Zirconium metal and hafnium metal were produced from zirconium chemical intermediates by one producer in Oregon and one in Utah. Zirconium chemicals were produced from domestic and imported materials by the metal producer in Oregon and by at least five other companies. The leading end use for zircon was ceramics. Other primary uses of zircon included foundry sand, refractories, and zirconium chemicals. The leading use of hafnium metal was in superalloys.

Salient Statistics—United States:	2021	2022	2023	2024	2025[e]
Production, zirconium ores and concentrates [zirconium oxide (ZrO_2) content]	<100,000	<100,000	<100,000	<100,000	<100,000
Imports:					
Zirconium ores and concentrates (ZrO_2 content)[1]	18,500	31,900	20,400	18,900	16,000
Zirconium, compounds	—	—	—	—	1,300
Zirconium, unwrought, powder, and waste and scrap	746	346	451	493	530
Zirconium, wrought	264	288	312	372	380
Hafnium, unwrought	23	43	72	64	72
Hafnium, wrought	NA	2	6	13	12
Exports:					
Zirconium ores and concentrates (ZrO_2 content)[1, 2]	10,000	11,200	13,200	15,400	10,000
Zirconium, unwrought, powder, and waste and scrap	589	1,090	1,080	1,180	1,300
Zirconium, wrought	966	821	706	808	1,000
Hafnium, unwrought	—	15	58	12	15
Hafnium, wrought	NA	3	3	5	7
Consumption, apparent,[3] zirconium ores and concentrates (ZrO_2 content)[1]	<100,000	<100,000	<100,000	<100,000	<100,000
Price:					
Zircon, dollars per metric ton (gross weight):					
Premium grade, cost, insurance, and freight, China[4]	1,530	2,300	2,160	2,000	1,800
Imported[5]	1,450	2,130	1,980	2,080	1,900
Zirconium, sponge, ex-works China,[6] dollars per kilogram	25	30	28	24	22
Hafnium, unwrought,[6] dollars per kilogram	781	1,590	6,130	4,560	3,800
Net import reliance[7] as a percentage of apparent consumption:					
Zirconium ores and concentrates	<25	<50	<25	<25	<25
Hafnium	NA	NA	NA	NA	NA

Recycling: Companies in Oregon and Utah recycled zirconium from new scrap generated during metal production and fabrication and (or) from post-commercial old scrap. Zircon foundry mold cores and spent or rejected zirconia refractories are often recycled but could not be quantified. Hafnium metal recycling was minimal.

Import Sources (2021–24): Zirconium ores and concentrates: South Africa, 48%; Australia, 35%; Senegal, 15%; and other, 2%. Zirconium, compounds: China, 41%; South Africa, 31%; France, 12%; Australia, 10%, and other, 6%. Zirconium, unwrought: China, 55%; Germany, 15%; Canada, 12%; France, 7%; and other, 11%. Zirconium, wrought: France, 72%; Germany, 10%; Belgium, 7%; China, 4%; and other, 7%. Hafnium, unwrought: Germany, 54%; China, 21%; France, 12%; United Kingdom, 8%; and other, 5%. Hafnium, wrought: Germany, 68%; China, 14%; France, 9%; Italy, 7%; and other, 2%.

Tariff: Item	Number	Normal Trade Relations 12–31–25
Zirconium ores and concentrates	2615.10.0000	Free.
Zirconium compounds	2825.60.0020, 2836.99.5010	3.7% ad valorem
Ferrozirconium	7202.99.1000	4.2% ad valorem.
Zirconium, unwrought and powder	8109.21.0000, 8109.29.0000	4.2% ad valorem.
Zirconium waste and scrap	8109.31.0000, 8109.39.0000	Free.
Other zirconium articles	8109.91.0000, 8109.99.0000	3.7% ad valorem.
Hafnium, unwrought, including powders	8112.31.0000	Free.
Hafnium, other	8112.39.0000	4% ad valorem.

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ZIRCONIUM AND HAFNIUM

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile: Not available.

Events, Trends, and Issues: Global mine production of zirconium mineral concentrates decreased by 12% to an estimated 1 million tons gross weight in 2025. Several companies continued exploration and development projects with planned production of zirconium mineral concentrates in Australia, Mozambique, South Africa, Sri Lanka, Tanzania, and elsewhere. The leading global exporters of zirconium mineral concentrates were Australia and South Africa. China was the leading importer of zirconium mineral concentrates. U.S. imports and exports of zirconium mineral concentrates decreased in 2025. Australia, Senegal, and South Africa were still the leading import sources of zirconium mineral concentrates. The United States was a net exporter of zirconium metal. U.S. exports of unwrought hafnium decreased whereas imports increased. The leading global exporters of unwrought hafnium were China and Germany.

World Mine Production and Reserves: Significant revisions were made to the 2024 production for Australia and Mozambique based on Government reports. World primary hafnium production data and quantitative estimates of hafnium reserves were not available. Zirconium reserves for Australia, China, Indonesia, and South Africa were revised based on company and Government reports.

	Zirconium mineral concentrates, mine production[e] (thousand metric tons, gross weight)		Zirconium reserves[8] (thousand metric tons, ZrO_2 content)[1]
	2024	2025	
United States	[9]100	[9]100	500
Australia	400	400	[10]55,000
China	100	100	500
Indonesia	81	52	3,400
Madagascar	31	26	2,100
Mozambique	[11]124	160	1,500
Senegal	[11]68	70	2,600
Sierra Leone	25	25	290
South Africa	290	270	5,900
Other countries	71	40	5,700
World total (rounded)	1,300	1,200	>70,000

World Resources:[8] Resources of zircon in the United States included about 14 million tons associated with titanium resources in heavy-mineral-sand deposits. Phosphate rock and sand and gravel deposits could potentially yield substantial amounts of zircon as a byproduct. World resources of hafnium are associated with those of zircon and baddeleyite. Quantitative estimates of hafnium resources were not available.

Substitutes: Chromite and olivine can substitute for zircon for some foundry applications. Dolomite and spinel refractories can also substitute for zircon in certain high-temperature applications. Niobium (columbium), stainless steel, and tantalum provide some substitution in nuclear applications, and titanium and synthetic materials may substitute in some chemical processing plant applications. Boron or cadmium-silver-indium alloys can substitute for hafnium metal in nuclear control rods. Zirconium can be used interchangeably with hafnium in certain superalloys.

[e]Estimated. E Net exporter. NA Not available. — Zero.
[1]Calculated ZrO_2 content as 65% of gross weight.
[2]Excludes zircon in mixed mineral concentrates.
[3]Defined as production + imports – exports.
[4]Source: Fastmarkets IM.
[5]Unit value based on landed-duty-paid United States imports for consumption from Australia, Senegal, and South Africa.
[6]Source: Argus Media group, Argus Non-Ferrous Markets, annual average.
[7]Defined as imports – exports.
[8]See Appendix C for resource and reserve definitions and information concerning data sources.
[9]Data are rounded to the nearest hundred thousand tons to avoid disclosing company proprietary data.
[10]For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 21 million tons, ZrO_2 content.
[11]Reported.

APPENDIX A

Abbreviations and Units of Measure

1 carat (metric) (diamond)	= 200 milligrams
1 flask (fl)	= 76 pounds, avoirdupois, or 34.47 kilograms
1 karat (gold)	= one twenty-fourth part
1 kilogram (kg)	= 2.2046 pounds, avoirdupois
1 kilopascal (kPa)	= 0.145 pounds per square inch
1 liter (L)	= 0.264172 gallon
1 long ton (lt)	= 2,240 pounds, avoirdupois
1 long ton unit (ltu)	= 1% of 1 long ton, or 22.4 pounds, avoirdupois
long calcined ton (lct)	= excludes water of hydration
long dry ton (ldt)	= excludes excess free moisture
Mcf	= 1,000 cubic feet
1 metric ton (t)	= 2,204.6 pounds, avoirdupois, or 1,000 kilograms
1 metric ton (t)	= 1.1023 short ton
1 metric ton unit (mtu)	= 1% of 1 metric ton, or 10 kilograms
metric dry ton (mdt)	= excludes excess free moisture
1 pound (lb)	= 453.6 grams
1 short ton (st)	= 2,000 pounds, avoirdupois
1 short ton unit (stu)	= 1% of 1 short ton, or 20 pounds, avoirdupois
short dry ton (sdt)	= excludes excess free moisture
1 square foot (ft^2)	= 0.092903 square meter
1 square mile (mi^2)	= 2.58999 square kilometers
1 troy ounce (tr oz)	= 1.09714 avoirdupois ounces, or 31.103 grams
1 troy pound	= 12 troy ounces

APPENDIX B

Definitions of Selected Terms Used in This Report

Terms Used for Materials in the National Defense Stockpile and Federal Helium Reserve

Fiscal year for the U.S. Government is the period from October 1 through September 30. Fiscal year (FY) 2025 is from October 1, 2024, through September 30, 2025. FY 2026 is from October 1, 2025, through September 30, 2026.

Inventory refers to the quantity of mineral materials held in the National Defense Stockpile or in the Federal Helium Reserve. Beginning in 2023, National Defense Stockpile shipments and inventory levels are no longer included.

Potential disposals indicate the total amount of a material in the National Defense Stockpile that the U.S. Department of Defense is permitted to dispose of under the Annual Materials Plan approved by Congress for the fiscal year. Congress has authorized disposal over the long term at rates designed to maximize revenue but avoid undue disruption to the usual markets and financial loss to the United States. Disposals are defined as any disposal or sale of National Defense Stockpile stock. Starting in FY 2026, the Annual Materials Plan is no longer available publicly. The Federal Helium System assets (formerly operated by the Bureau of Land Management) were sold and transferred in June 2024 to a private company. This satisfied the requirements of the Helium Stewardship Act of 2013 (HSA), which mandated the privatization of the Federal Helium System.

Potential acquisitions indicate the maximum amount of a material that may be acquired by the U.S. Department of Defense for the National Defense Stockpile under the Annual Materials Plan approved by Congress for the fiscal year.

Depletion Allowance

The depletion allowance is a business tax deduction analogous to depreciation, but which applies to an ore reserve rather than equipment or production facilities. Federal tax law allows this deduction from taxable corporate income, recognizing that an ore deposit is a depletable asset that must eventually be replaced.

APPENDIX C

Reserves and Resources

Reserves data are dynamic. They may be reduced as ore is mined and (or) the feasibility of extraction diminishes, or more commonly, they may continue to increase as additional deposits (known or recently discovered) are developed, or currently exploited deposits are more thoroughly explored and (or) new technology or economic variables improve their economic feasibility. Reserves may be considered a working inventory of mining companies' supplies of an economically extractable mineral commodity. As such, the magnitude of that inventory is necessarily limited by many considerations, including cost of drilling, taxes, price of the mineral commodity being mined, and the demand for it. Reserves will be developed to the point of business needs and geologic limitations of economic ore grade and tonnage. For example, in 1970, identified and undiscovered world copper resources were estimated to contain 1.6 billion metric tons of copper, with reserves of about 280 million tons of copper. Since then, about 712 million tons of copper have been produced worldwide, but world copper reserves in 2024 were estimated to be 980 million tons of copper, more than 3.5 times those in 1970, despite the depletion by mining of much more than the 1970 estimated reserves.

Future supplies of minerals will come from reserves and other identified resources, currently undiscovered resources in deposits that will be discovered in the future, and material that will be recycled from current in-use stocks of minerals or from minerals in waste disposal sites. Undiscovered deposits of minerals constitute an important consideration in assessing future supplies. Mineral-resource assessments have been carried out for small parcels of land being evaluated for land reclassification, for the Nation, and for the world.

Part A—Resource and Reserve Classification for Minerals[1]

Introduction

Through the years, geologists, mining engineers, and others operating in the minerals field have used various terms to describe and classify mineral resources, which as defined herein include energy materials. Some of these terms have gained wide use and acceptance, although they are not always used with precisely the same meaning.

The U.S. Geological Survey (USGS) collects information about the quantity and quality of all mineral resources. In 1976, the USGS and the U.S. Bureau of Mines developed a common classification and nomenclature, which was published as USGS Bulletin 1450–A—"Principles of the Mineral Resource Classification System of the U.S. Bureau of Mines and U.S. Geological Survey." Experience with this resource classification system showed that some changes were necessary in order to make it more workable in practice and more useful in long-term planning. Therefore, representatives of the USGS and the U.S. Bureau of Mines collaborated to revise Bulletin 1450–A. Their work was published in 1980 as USGS Circular 831—"Principles of a Resource/Reserve Classification for Minerals."

Long-term public and commercial planning must be based on the probability of discovering new deposits, on developing economic extraction processes for currently unworkable deposits, and on knowing which resources are immediately available. Thus, resources must be continuously reassessed in the light of new geologic knowledge, of progress in science and technology, and of shifts in economic and political conditions. To best serve these planning needs, known resources should be classified from two standpoints: (1) purely geologic or physical and chemical characteristics—such as grade, quality, tonnage, thickness, and depth—of the material in place; and (2) profitability analyses based on costs of extracting and marketing the material in a given economy at a given time. The former constitutes important objective scientific information of the resource and a relatively unchanging foundation upon which the latter more valuable economic delineation can be based.

The revised classification system, designed generally for all mineral materials, is shown graphically in figures C1 and C2; its components and their usage are described in the text. The classification of mineral and energy resources is necessarily arbitrary because definitional criteria do not always coincide with natural boundaries. The system can be used to report the status of mineral and energy-fuel resources for the Nation or for specific areas.

Resource and Reserve Definitions

A dictionary definition of resource, "something in reserve or ready if needed," has been adapted for mineral and energy resources to comprise all materials, including those only surmised to exist, that have present or anticipated future value.

Resource.—A concentration of naturally occurring solid, liquid, or gaseous material in or on the Earth's crust in such form and amount that economic extraction of a commodity from the concentration is currently or potentially feasible.

Original Resource.—The amount of a resource before production.

Identified Resources.—Resources for which location, grade, quality, and quantity are known or estimated from specific geologic evidence. Identified resources include economic, marginally economic, and subeconomic components. To reflect varying degrees of geologic certainty, these economic divisions can be subdivided into measured, indicated, and inferred.

[1]Based on U.S. Geological Survey Circular 831, 1980.

Demonstrated.—A term for the sum of measured plus indicated resources.

Measured.—Quantity is computed from dimensions revealed in outcrops, trenches, workings, or drill holes; grade and (or) quality are computed from the results of detailed sampling. The sites for inspection, sampling, and measurements are spaced so closely and the geologic character is so well defined that size, shape, depth, and mineral content of the resource are well established.

Indicated.—Quantity and grade and (or) quality are computed from information similar to that used for measured resources, but the sites for inspection, sampling, and measurements are farther apart or are otherwise less adequately spaced. The degree of assurance, although lower than that for measured resources, is high enough to assume continuity between points of observation.

Inferred.—Estimates are based on an assumed continuity beyond measured and (or) indicated resources, for which there is geologic evidence. Inferred resources may or may not be supported by samples or measurements.

Reserve Base.—That part of an identified resource that meets specified minimum physical and chemical criteria related to current mining and production practices, including those for grade, quality, thickness, and depth. The reserve base is the in-place demonstrated (measured plus indicated) resource from which reserves are estimated. It may encompass those parts of the resources that have a reasonable potential for becoming economically available within planning horizons beyond those that assume proven technology and current economics. The reserve base includes those resources that are currently economic (reserves), marginally economic (marginal reserves), and some of those that are currently subeconomic (subeconomic resources). The term “geologic reserve” has been applied by others generally to the reserve-base category, but it also may include the inferred-reserve-base category; it is not a part of this classification system.

Inferred Reserve Base.—The in-place part of an identified resource from which inferred reserves are estimated. Quantitative estimates are based largely on knowledge of the geologic character of a deposit and for which there may be no samples or measurements. The estimates are based on an assumed continuity beyond the reserve base, for which there is geologic evidence.

Reserves.—That part of the reserve base that could be economically extracted or produced at the time of determination. The term “reserves” need not signify that extraction facilities are in place and operative. Reserves include only recoverable materials; thus, terms such as “extractable reserves” and “recoverable reserves” are redundant and are not a part of this classification system.

Marginal Reserves.—That part of the reserve base which, at the time of determination, borders on being economically producible. Its essential characteristic is economic uncertainty. Included are resources that would be producible, given postulated changes in economic or technological factors.

Economic.—This term implies that profitable extraction or production under defined investment assumptions has been established, analytically demonstrated, or assumed with reasonable certainty.

Subeconomic Resources.—The part of identified resources that does not meet the economic criteria of reserves and marginal reserves.

Undiscovered Resources.—Resources, the existence of which are only postulated, comprising deposits that are separate from identified resources. Undiscovered resources may be postulated in deposits of such grade and physical location as to render them economic, marginally economic, or subeconomic. To reflect varying degrees of geologic certainty, undiscovered resources may be divided into two parts, as follows:

Hypothetical Resources.—Undiscovered resources that are similar to known mineral bodies and that may be reasonably expected to exist in the same producing district or region under analogous geologic conditions. If exploration confirms their existence and reveals enough information about their quality, grade, and quantity, they will be reclassified as identified resources.

Speculative Resources.—Undiscovered resources that may occur either in known types of deposits in favorable geologic settings where mineral discoveries have not been made, or in types of deposits as yet unrecognized for their economic potential. If exploration confirms their existence and reveals enough information about their quantity, grade, and quality, they will be reclassified as identified resources.

Restricted Resources or Reserves.—That part of any resource or reserve category that is restricted from extraction by laws or regulations. For example, restricted reserves meet all the requirements of reserves except that they are restricted from extraction by laws or regulations.

Other Occurrences.—Materials that are too low grade or for other reasons are not considered potentially economic, in the same sense as the defined resource, may be recognized and their magnitude estimated, but they are not classified as resources. A separate category, labeled “other occurrences,” is included in figures C1 and C2. In figure C1, the boundary between subeconomic and other occurrences is limited by the concept of current or potential feasibility of economic production, which is required by the definition of a resource. The boundary is obviously uncertain, but limits may be specified in terms of grade, quality, thickness, depth, extractable percentage, or other economic-feasibility variables.

Cumulative Production.—The amount of past cumulative production is not, by definition, a part of the resource. Nevertheless, a knowledge of what has been produced is important in order to understand current resources, in terms of both the amount of past production and the amount of residual or remaining in-place resource. A separate space for cumulative production is shown in figures C1 and C2. Residual material left in the ground during current or future extraction should be recorded in the resource category appropriate to its economic-recovery potential.

Figure C1.—Major Elements of Mineral-Resource Classification, Excluding *Reserve Base* and *Inferred Reserve Base*

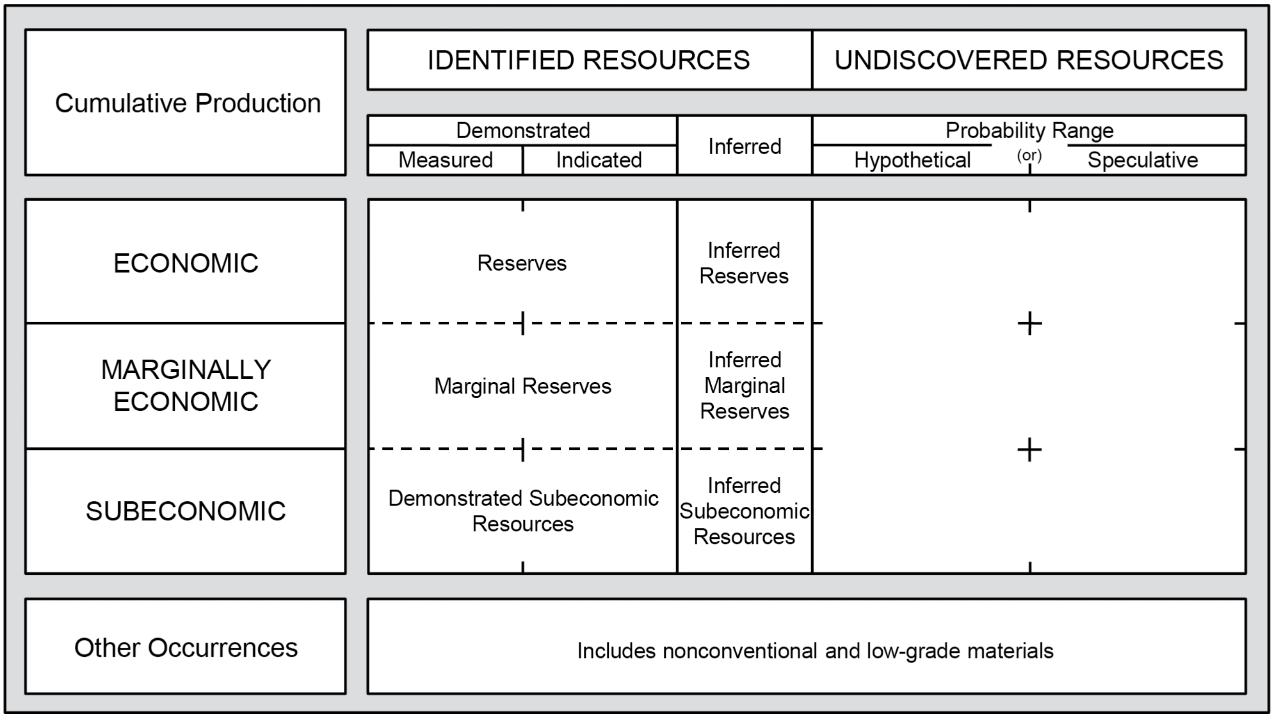
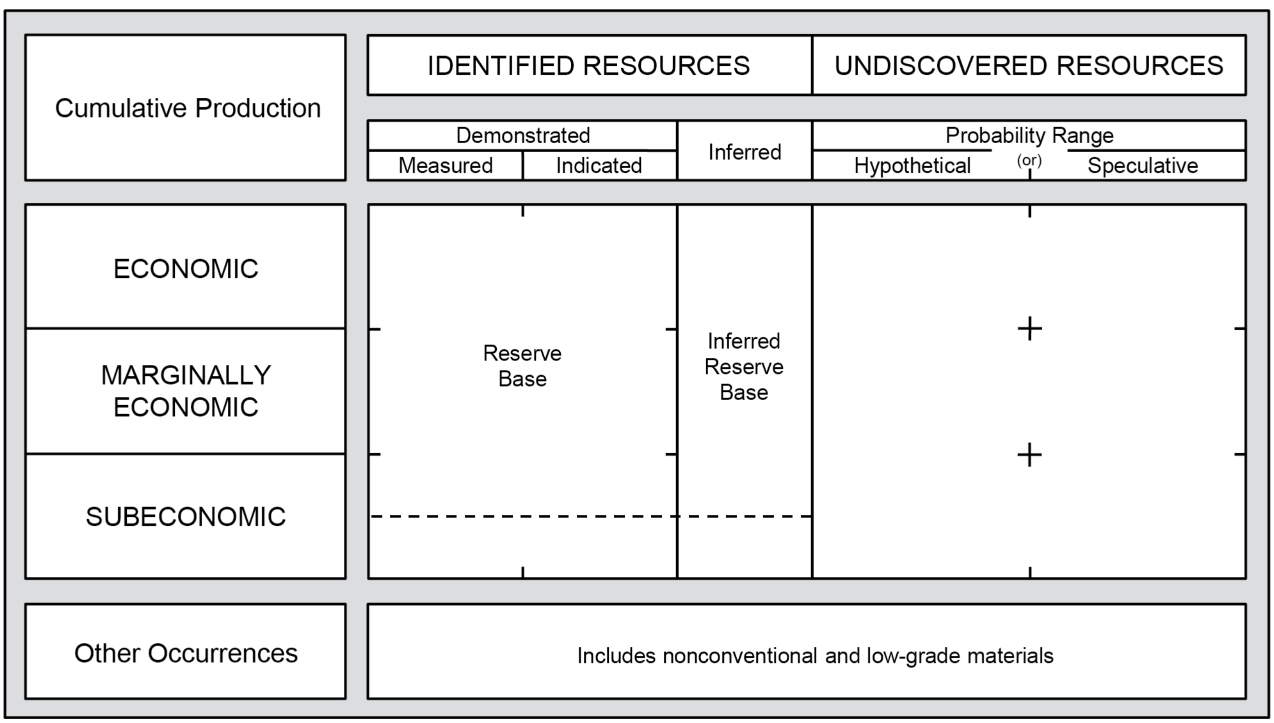


Figure C2.—*Reserve Base* and *Inferred Reserve Base* Classification Categories



Part B—Sources of Reserves Data

National information on reserves for most mineral commodities found in this report, including those for the United States, is derived from a variety of sources. The ideal source of such information would be comprehensive evaluations that apply the same criteria to deposits in different geographic areas and report the results by country. In the absence of such evaluations, national reserves estimates compiled by countries for selected mineral commodities are a primary source of national reserves information. Lacking national assessment information by governments, sources such as academic articles, company reports, presentations by company representatives, and trade journal articles, or a combination of these, serve as the basis for national information on reserves reported in the mineral commodity sections of this publication.

A national estimate may be assembled from the following: historically reported reserves information carried for years without alteration because no new information is available, historically reported reserves reduced by the amount of historical production, and company-reported reserves. International minerals availability studies conducted by the U.S. Bureau of Mines before 1996 and estimates of identified resources by an international collaborative effort (the International Strategic Minerals Inventory) are the bases for some reserves estimates. The USGS collects some qualitative information about the quantity and quality of mineral resources but does not directly measure reserves or resources, and companies or governments do not directly report information about reserves or resources to the USGS. Reassessment of reserves is a continuing process, and the intensity of this process differs by mineral commodity, country, and time period.

Some countries have specific definitions for reserves data, and reserves for each country are assessed separately, based on reported data and definitions. An attempt is made to make reserves consistent among countries for a mineral commodity and its byproducts. For example, the Australasian Joint Ore Reserves Committee (JORC) established the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code) that sets out minimum standards, recommendations, and guidelines for public reporting in Australasia of exploration results, mineral resources, and ore reserves. Companies listed on the Australian Securities Exchange and the New Zealand Stock Exchange are required to report publicly on ore reserves and mineral resources under their control, using the JORC Code.

Data reported for individual deposits by mining companies are compiled in Geoscience Australia's national mineral resources database and used in the preparation of the annual national assessments of Australia's mineral resources. Because of its specific use in the JORC Code, the term "reserves" is not used in the national inventory, where the highest category is "Economic Demonstrated Resources" (EDR). In essence, EDR combines the JORC Code categories "proved reserves" and "probable reserves," plus measured resources and indicated resources. This is considered to provide a reasonable and objective estimate of what is likely to be available for mining in the long term. Accessible Economic Demonstrated Resources represent the resources within the EDR category that are accessible for mining. Reserves for Australia in the Mineral Commodity Summaries 2026 are Accessible EDR. For more information, see "Australia's Estimated Ore Reserves as at December 2023—Table 2" (https://www.ga.gov.au/aimr2024/australias-estimated-ore-reserves).

In Canada, the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) provides definition standards for the classification of mineral resources and mineral reserves estimates into various categories. The category to which a resource or reserves estimate is assigned depends on the level of confidence in the geologic information available on the mineral deposit, the quality and quantity of data available on the deposit, the level of detail of the technical and economic information that has been generated about the deposit, and the interpretation of the data and information. For more information on the CIM definition standards, see https://mrmr.cim.org/media/1128/cim-definition-standards_2014.pdf.

In Russia, reserves for most minerals can appear in a number of sources, although no comprehensive list of reserves is published. Reserves data for a limited set of mineral commodities are available in the annual report "Gosudarstvennyi Doklad o Sostoyanii i Ispol'zovanii Mineral'no-Syryevyh Resursov Rossiyskoy Federatsii" (State Report on the State and Use of Mineral and Raw Materials Resources of the Russian Federation), which is published by Russia's Ministry of Natural Resources and Environment. Reserves data for various minerals appear at times in journal articles, such as those in the journal "Mineral'nyye Resursy Rossii. Ekonomika i Upravleniye" (Mineral Resources of Russia. Economics and Management), which is published by the "OOO RG-Inform," a subsidiary of Rosgeologiya Holding. Also, reserves data for individual jurisdictions are available on the website of the Federal'noye Agentstvo po Nedropol'zovaniyu (Federal Agency for Subsoil Use). It is sometimes not clear if the reserves are being reported in ore or mineral content. It is also in many cases not clear which definition of reserves is being used, because the system inherited from the former Soviet Union has a number of ways in which the term "reserves" is defined, and these definitions qualify the percentage of resources that are included in a specific category. For example, the Soviet reserves classification system, besides the categories A, B, C1, and C2, which represent progressively detailed knowledge of a mineral deposit based on exploration data, has other subcategories cross imposed upon the system. Under the broad category reserves (zapasy), there are subcategories that include balance reserves (balansovyye zapasy, or economic reserves) and outside-the-balance reserves (zabalansovye zapasy, or subeconomic reserves), as well as categories that include explored, industrial, and proven reserves, and the reserves totals can vary significantly, depending on the specific definition of reserves being reported.

APPENDIX D

Country Specialists Directory

Minerals information country specialists at the U.S. Geological Survey collect and analyze information on the mineral industries of more than 170 nations throughout the world. The specialists are available to answer minerals-related questions concerning individual countries.

Africa and the Middle East

Algeria	Kathleen D. Gans
Angola	Meralis Plaza-Toledo
Bahrain	Iman Salehihikouei
Benin	Meralis Plaza-Toledo
Botswana	Yadira Soto-Viruet
Burkina Faso	Alberto Alexander Perez
Burundi	Yadira Soto-Viruet
Cabo Verde	Meralis Plaza-Toledo
Cameroon	Edgardo J. Pujols
Central African Republic	Edgardo J. Pujols
Chad	Edgardo J. Pujols
Comoros	Edgardo J. Pujols
Congo (Brazzaville)	Edgardo J. Pujols
Congo (Kinshasa)	Edgardo J. Pujols
Côte d’Ivoire	Alberto Alexander Perez
Djibouti	Alberto Alexander Perez
Egypt	Kathleen D. Gans
Equatorial Guinea	Meralis Plaza-Toledo
Eritrea	Alberto Alexander Perez
Eswatini	Edgardo J. Pujols
Ethiopia	Meralis Plaza-Toledo
Gabon	Alberto Alexander Perez
The Gambia	Meralis Plaza-Toledo
Ghana	Meralis Plaza-Toledo
Guinea	Alberto Alexander Perez
Guinea-Bissau	Meralis Plaza-Toledo
Iran	Iman Salehihikouei
Iraq	Iman Salehihikouei
Israel	Kathleen D. Gans
Jordan	Iman Salehihikouei
Kenya	Meralis Plaza-Toledo
Kuwait	Iman Salehihikouei
Lebanon	Kathleen D. Gans
Lesotho	Edgardo J. Pujols
Liberia	Meralis Plaza-Toledo
Libya	Kathleen D. Gans
Madagascar	Meralis Plaza-Toledo
Malawi	Jesse J. Inestroza
Mali	Alberto Alexander Perez
Mauritania	Meralis Plaza-Toledo
Mauritius	Edgardo J. Pujols
Morocco and Western Sahara	Kathleen D. Gans
Mozambique	Meralis Plaza-Toledo
Namibia	Edgardo J. Pujols
Niger	Alberto Alexander Perez
Nigeria	Meralis Plaza-Toledo
Oman	Iman Salehihikouei
Qatar	Iman Salehihikouei
Reunion	Edgardo J. Pujols
Rwanda	Yolanda Fong-Sam

Africa and the Middle East—Continued

Sao Tome e Principe	Meralis Plaza-Toledo
Saudi Arabia	Iman Salehihikouei
Senegal	Alberto Alexander Perez
Seychelles	Edgardo J. Pujols
Sierra Leone	Alberto Alexander Perez
Somalia	Edgardo J. Pujols
South Africa	Edgardo J. Pujols
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Tanzania	Yolanda Fong-Sam
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Japan	Keita F. DeCarlo
Korea, North	Jaewon Chung
Korea, Republic of	Jaewon Chung
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New Zealand	Loyd M. Trimmer III
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Solomon Islands	Loyd M. Trimmer III
Sri Lanka	Keita F. DeCarlo
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Austria	Kathleen R. Trafton
Azerbaijan	Elena Safirova
Belarus	Elena Safirova
Belgium	Elizabeth R. Neustaedter
Bosnia and Herzegovina	Kathleen R. Trafton
Bulgaria	Karine M. Renaud
Croatia	Kathleen R. Trafton
Cyprus	Kristian A. Macias
Czechia	Elizabeth R. Neustaedter
Denmark, Faroe Islands, and Greenland	Joanna Asha Goclawska
Estonia	Alexandru Hostiuc
Finland	Joanna Asha Goclawska
France	Kathleen R. Trafton
Georgia	Elena Safirova
Germany	Karine M. Renaud
Greece	Kristian A. Macias
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Kazakhstan	Karine M. Renaud
Kosovo	Kristian A. Macias
Kyrgyzstan	Karine M. Renaud
Latvia	Alexandru Hostiuc
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Luxembourg	Elizabeth R. Neustaedter
Malta	Kristian A. Macias
Moldova	Alexandru Hostiuc
Montenegro	Kristian A. Macias
Netherlands	Elizabeth R. Neustaedter
North Macedonia	Kathleen R. Trafton
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Poland	Joanna Asha Goclawska
Portugal	Kristian A. Macias
Romania	Alexandru Hostiuc
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Turkey	Alexandru Hostiuc
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Panama	Jesse J. Inestroza
Trinidad and Tobago	Yadira Soto-Viruet

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Brazil	Yolanda Fong-Sam
Chile	Yadira Soto-Viruet
Colombia	Jesse J. Inestroza
Ecuador	Jesse J. Inestroza
French Guiana	Yolanda Fong-Sam
Guyana	Yolanda Fong-Sam
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