



2022 Minerals Yearbook

NIOBIUM [ADVANCE RELEASE]

U.S. Geological Survey, Reston, Virginia: 2026

For more information on the USGS—the Federal source for science about the Earth, its natural and living resources, natural hazards, and the environment—visit <https://www.usgs.gov> or call 1–888–392–8545.

For an overview of USGS information products, including maps, imagery, and publications, visit <https://store.usgs.gov/> or contact the store at 1–888–275–8747.

Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Although this information product, for the most part, is in the public domain, it also may contain copyrighted materials as noted in the text. Permission to reproduce copyrighted items must be secured from the copyright owner.

NIObIUM

By Chad A. Friedline

Domestic survey data and tables were prepared by Christine K. Pisut, statistical assistant.

In 2022, U.S. niobium apparent consumption (niobium content) was 8,440 metric tons (t), an increase of 17% from 7,240 t in 2021 (revised) (table 1). No domestic mine production of niobium ore was reported. The niobium content of world mine production was 83,700 t, 4% less than the revised total in 2021 (tables 1, 4). The United States imported 9,110 t of niobium contained in niobium-bearing metal, alloys, ores and concentrates, an increase of 11% from 8,230 t (revised) in 2021. In the same period, the United States exported 668 t of niobium contained in niobium-bearing alloys and ores and concentrates, a decrease of 33% from 992 t (revised) in 2021. World trade of niobium materials included ferroniobium and niobium metal, ores and concentrates, and scrap. Ferroniobium was the leading imported and exported niobium material in the United States in terms of value (table 3). The leading reported end use of niobium was as an alloying element in superalloys, followed by stainless and heat-resisting steel and full alloy steel (table 2).

Government Actions and Legislation

The United States is heavily reliant on imports of certain mineral commodities vital to the Nation's security and economic prosperity. This dependency on foreign sources creates a strategic vulnerability for the U.S. economy and military to adverse foreign Government action, natural disasters, and other events that can disrupt the supply of critical minerals. On February 24, 2022, the U.S. Geological Survey (USGS), through the U.S. Department of the Interior (DOI), published the "2022 Final List of Critical Minerals" in the Federal Register (87 FR 10381) in response to section 7002 of the Energy Act of 2020 (Public Law 116-260). The revised list included 50 mineral commodities that included niobium, compared with 35 mineral commodities in the 2018 list, and featured the addition of nickel, zinc, individual platinum-group metals, and rare-earth elements (REEs), while removing helium, potash, rhenium, strontium, and uranium. The list is expected to be updated every 3 years (U.S. Department of the Interior, 2022).

Niobium was first added to the U.S. Government stockpile in 1943 (as columbite ore), and the U.S. Congress designated niobium as a strategic and critical material in 1946 by means of the Strategic and Critical Materials Stock Piling Act as amended through Public Law 79-520, July 23, 1946 (DeMille, 1947, p. 135). The Defense Logistics Agency Strategic Materials, U.S. Department of Defense, did not designate niobium materials for potential acquisition or disposal from the National Defense Stockpile under its fiscal year 2023 (October 1, 2022, to September 30, 2023) Annual Materials Plan (Defense Logistics Agency Strategic Materials, 2022a, b).

Production

Globally, pyrochlore was the leading mineral mined for niobium. Niobium minerals typically were converted to ferroniobium and other value-added products at the mine site. The primary marketable niobium materials were ferroniobium and niobium metal, ore, and oxide. Niobium resources in the United States are low grade and have not been commercially recoverable at past prices and technology. As a result, domestic supply has been a concern during every national military emergency since World War I. In 2022, no domestic niobium mine production was reported. Recycled materials and stocks were the only domestic sources of niobium.

NioCorp Developments Ltd. (Centennial, CO), a resource company developing a niobium deposit in Elk Creek, NE, announced that during the fiscal year ending June 30, 2022, it had completed a new feasibility study that incorporated the production of REEs, updated its mine plan, and filed a technical report with the U.S. Securities and Exchange Commission (SEC). The company advanced its process design that included the recovery and production of high purity, fully separated magnetic REEs (dysprosium oxide, neodymium-praseodymium oxide, and terbium oxide), and expected niobium, scandium, and titanium products. When active, the mining operation was expected to produce 171,000 t of payable niobium content of ferroniobium, 3,680 t of scandium oxide, and 432,000 t of titanium dioxide during a 38-year mine life. In 2022, NioCorp initiated and completed the construction of its demonstration plant in Trois-Rivieres, Quebec, Canada. The plant was expected to be used to validate bench- and pilot-scale test results, provide updated recovery percentages, and finalize the design of the optimized production plant (NioCorp Developments Ltd., 2022, p. 2, 30, 31, 34).

Consumption

Domestic consumption data for niobium materials were developed by the USGS by means of the "Columbium (Niobium) and Tantalum," "Consolidated Consumers," and "Specialty Ferroalloys" surveys. For niobium materials, 1 consumer responded to the "Columbium (Niobium) and Tantalum" canvass, 12 responded to the "Consolidated Consumers" canvass, and none responded to the "Specialty Ferroalloys" canvass. Domestic consumption data for raw materials were withheld to avoid disclosing company proprietary data.

Total domestic apparent consumption of niobium was 8,440 t in 2022, a 17% increase from that in 2021 (table 1). Reported consumption of niobium by the steel industry was 5,680 t in 2022, a 24% increase from 4,560 t (revised) in 2021 (table 2). Reported consumption for alloys (excluding steels and superalloys) and superalloys was 17 t in 2022, unchanged from that in 2021. Ferroniobium, the leading niobium material consumed in the United States, was used typically in the production of high-strength low-alloy (HSLA) steel and stainless steel. Other uses of niobium included the fabrication of nonferrous and niobium alloys, superalloys, and production of niobium carbides and chemicals.

Prices

Niobium materials were not openly traded on exchanges. Purchase contracts were confidential between buyer and seller. Based on U.S. Census Bureau data for 2022, the average unit value of traded (imported plus exported) niobium-containing materials was \$29.68 per kilogram for niobium ores and concentrates (a 16% decrease from that in 2021), \$36.00 per kilogram for niobium oxide (Nb_2O_5) (a 5% increase from that in 2021), and \$25.07 per kilogram for ferroniobium (a 20% increase from that in 2021) (tables 1, 3).

Foreign Trade

According to the U.S. Census Bureau, the United States exported niobium materials valued at \$11.6 million in 2022 (a 57% decrease from that in 2021) and imported niobium materials valued at \$469 million (a 27% increase from that in 2021) (table 3). Traded niobium materials included ferroniobium and niobium metal, ores and concentrates, and oxide. In 2022, exports of ferroniobium decreased by 31% from those in 2021, and imports for consumption increased slightly. Ferroniobium was the leading niobium material traded by value, accounting for 54% of the total import value and 96% of the total export value. In 2022, Brazil continued to be the leading supplier of ferroniobium and niobium metal and oxides (table 3). The leading destinations of United States ferroniobium exports, in descending order of gross weight, were Mexico and Canada.

World Industry Structure

Niobium ore was mined primarily in Brazil, Canada, and countries in the Great Lakes region of Africa, including Congo (Kinshasa) and Rwanda, and was beneficiated typically to concentrates containing 55% to 60% Nb_2O_5 . Concentrates were further processed to produce ferroniobium or niobium metal and oxides. Ferroniobium, the leading commercial niobium-containing material, typically contained about 66% niobium (Roskill Information Services Ltd., 2021, p. 72).

In 2022, world production of niobium contained in cassiterite, columbite-tantalite, loparite, and pyrochlore concentrates was 83,700 t (table 4), a decrease of 4% from the revised 2021 total. World production of ferroniobium, in terms of niobium content, was estimated to be 70,000 t, a 6% decrease from that in 2021 (table 5). Brazil and Canada were the leading producers of ferroniobium (table 5) and niobium mineral concentrates (table 4), accounting for more than 99% of global ferroniobium production and 98% of global niobium mineral concentrates production.

Based on consumption data from Mordor Intelligence Pvt. Ltd. and Project Blue Group Ltd., the USGS estimated that China accounted for approximately 30% to 60% of global niobium consumption. Ferroniobium was the primary form of niobium consumed globally, accounting for 88% of the market in 2022, whereas niobium oxide and niobium metal made up 9% and 2%, respectively, and vacuum-grade niobium alloys accounted for the remaining 1% of the market. Globally, the construction industry was the largest end user, consuming approximately 49% of the niobium, followed by automotive and shipbuilding, 24%; oil and gas, 16%; aerospace and defense, 4%; and other industries, 7%. Steel, primarily HSLA steel used in structural, automotive, and aerospace applications, accounted for approximately 89% of global niobium consumption, whereas alloys and metal and magnetic materials made up 9% and 1%, respectively, and chemicals accounted for the remaining 1%. Project Blue estimated that approximately 14% of the total crude steel produced used niobium as an alloy (Mordor Intelligence Pvt. Ltd., 2023b; Project Blue Group Ltd., 2024a, p. 4, 6; 2024b).

In Brazil, the leading producers of niobium were Companhia Brasileira de Metalurgia e Mineração (CBMM) and Niobras Mineração Ltda. [a subsidiary of China Molybdenum Co., Ltd. (China)]. In Canada, the leading producer was Niobec Inc. (a subsidiary of Magris Resources Inc.).

World Review

Australia.—Australian Strategic Materials Ltd. (ASM), a resource company developing the Dubbo Project in Toongi, New South Wales, announced that during the fiscal year ending June 30, 2022, it had completed the project's optimization study, submitted licensing requests and were waiting to receive approvals, awarded to Hyundai Engineering Co., Ltd. a conditional contract for design work for the Dubbo Project, and completed construction of the onsite Dubbo Project Office. The Dubbo Project contains hafnium, niobium, REEs (including yttrium), and zirconium resources. ASM intended to develop the project to produce oxides onsite for subsequent refining into critical metals at its metals plant in the Republic of Korea. The Dubbo Project was development ready, subject to financing, with the mineral deposit and surrounding land acquired, all major State and Federal approvals in place, and piloting and engineering studies completed. According to the company's 2021 mineral resource estimate, total measured and indicated resources at the Dubbo Project were estimated to be 75 million metric tons (Mt) at 0.44% Nb_2O_5 and 0.03% Ta_2O_5 , supporting a potential 75-year mine life at an ore-processing rate of 1 million metric tons per year (Australian Strategic Materials Ltd., 2021, p. 17; 2022, p. 4, 8, 12, 14, 17, 21, 43).

Brazil.—CBMM operated the Araxa Mine and industrial complex in Minas Gerais State. CBMM was a closely held corporation with 70% of its capital owned by Grupo Moreira Salles, 15% by a Japanese and South Korean consortium, and 15% by a Chinese consortium. In 2022, CBMM reported that it produced 99,460 t in gross weight of niobium products, including 87,880 t of ferroniobium and 11,580 t of specialty products consisting primarily of niobium oxide and alloys. This production represented a 49% increase of specialty products and a 4% decrease of ferroniobium from that produced in 2021. CBMM reported that it sold 86,904 t in gross weight of niobium

products in 2022—4% in Brazil and 96% to other countries. In 2022, CBMM announced plans to invest approximately \$59 million¹ in its niobium oxide production assets, including the construction of a new niobium oxide plant for lithium-ion batteries, expected to start operations in 2024 with a production capacity of 3,000 metric tons per year (t/yr) (Companhia Brasileira de Metalurgia e Mineração, 2023, p. 6, 9, 25, 70, 71).

Mineração Taboca S.A. [a subsidiary of MINSUR S.A. (Peru)] operated the Pitinga-Pirapora Mine complex in Amazonas State. In 2022, the company reported production of 4,008 t in gross weight of niobium and tantalum ferroalloys, a 5-t increase from 4,003 t in 2021. (MINSUR S.A., 2024, p. 15, 33, 81).

Niobras Mineração, a subsidiary of China Molybdenum, operated the Boa Vista Mine and ferroalloy plant in Goiás State. In 2022, China Molybdenum reported that it produced 9,212 t of niobium contained in ferroniobium, a 7% increase from 8,586 t in 2021 (China Molybdenum Co., Ltd., 2023, p. 2, 29, 54, 56).

Canada.—Niobec Inc. (a subsidiary of Magris Performance Materials Inc.) operated the Niobec Mine and processing and metallurgical complex in Saint-Honore, Quebec. In 2022, Magris reported a production capacity of 11,700 t/yr of standard-grade ferroniobium, containing approximately 66% niobium and 34% iron, in the company's first publicly available sustainability report. According to Magris, the regions to which it sold niobium were, in descending order of quantity, North America, 45%; EMEA (Europe, Middle East, and Africa), 41%; Asia (excluding China), 6%; South America, 4%; and China, 4%. The company primarily sold ferroniobium through bilaterally negotiated contracts, with some sales on the niobium spot market. Niobec had been in operation since 1976 and had a production capacity of more than 10,000 t/yr of ferroniobium. The operation was one of three primary niobium producers in the world, accounting for approximately 10% of the global niobium market between 1976 and 2022, and was the only primary operation located outside of Brazil (Magris Performance Materials Inc., 2023, p. 4, 5, 25–27).

China.—Yichun Tantalum Niobium Mine Co., Ltd. (a subsidiary of Jiangxi Tungsten Industry holding Group Co., Ltd.) operated the Yichun Mine (also known as the 414 Mine) in Yichun, Jiangxi Province. Niobium concentrate production was not disclosed for 2022.

China was not a large producer of niobium feedstock. In 2022, the USGS estimated that China's niobium mine production was 45 t, which had remained relatively unchanged during the previous few years and accounted for less than 1% of total global mine production (table 4). Although China was not a major producer, it was the world's leading importer of ferroniobium, primarily sourced from Brazil and Canada, which together produced nearly all the global ferroniobium feedstock in 2022 (table 5). In 2022, China imported approximately 21,700 t of ferroniobium (niobium content) and accounted for 26% of total global ferroniobium imports, an 18% decrease in quantity from 26,300 t in 2021. Of the 21,700 t of ferroniobium imported by China, 99% (21,400 t) came from Brazil, a 15% decrease in quantity from that in 2021. In 2022, China

accounted for 40% of Brazil's global ferroniobium exports. Additionally, China imported about 300 t from Canada in 2022 compared with 1,100 t in 2021 (Zen Innovations AG, 2024).

In 2022, niobium demand in China was affected by a decrease in end-use consumption of steel products owing to concurrent events affecting consumer demand, including the conflict in Ukraine, ongoing global coronavirus disease 2019 (COVID-19) pandemic mitigation measures, rising energy costs and interest rates, and global inflation. These economic conditions significantly affected steel production, with global finished steel production decreasing by 4% in 2022. Because steel consumption is the primary component of niobium demand, these events subsequently influenced the global niobium market, particularly because China was the largest base for electronics production, the top automotive manufacturer, and the largest construction market globally (Mordor Intelligence Pvt. Ltd., 2023a, p. 17, 23, 66, 67, 78, 87; Tuck, 2023).

Russia.—LLC Lovozero GOK operated the Lovozero Mine in Murmansk Province. The company produced loparite mineral concentrates used by the JSC Solikamsk Magnesium Works (SMZ) facility to produce niobium compounds in Perm Krai. In 2022, SMZ produced 534 t of Nb₂O₅ content of niobium compounds, an 18% decrease from 650 t in 2021. More than 90% of the company's shipments were sent primarily to consumers in Russia, and most of the remaining amount was sent to Europe, North America, and South America (JSC Solikamsk Magnesium Works, 2024, p. 10).

Outlook

Currently, operating niobium mines have adequate reserves to meet global demand for the foreseeable future (Friedline, 2023, p. 125). The steel industry is the largest consumer of niobium (mainly in HSLA steel), and niobium demand is expected to remain closely aligned with trends in global steel production. Potential new sources of niobium typically are associated with the production of other mineral deposits with niobium as a byproduct. Several potential new niobium sources were in development during 2022, mostly in Australia and Canada.

References Cited

- Australian Strategic Materials Ltd., 2021, Annual report to shareholders: Perth, Western Australia, Australia, Australian Strategic Materials Ltd. press release, October 22, 86 p. (Accessed August 9, 2022, via <https://asmd.irmau.com/site/pdf/40ea7ebd-4c56-44de-a0e2-869eda3d3f11/Annual-Report-to-shareholders.pdf>.)
- Australian Strategic Materials Ltd., 2022, Annual report to shareholders: Perth, Western Australia, Australia, Australian Strategic Materials Ltd. press release, October 20, 104 p. (Accessed July 30, 2024, at <https://asmd.irmau.com/site/pdf/1b0d6bb3-2705-40af-8579-62e2164863b0/2022-Annual-Report-to-Shareholders.pdf>.)
- China Molybdenum Co., Ltd., 2023, Annual results announcement for the year ended 31 December 2022: Beijing, China, China Molybdenum Co., Ltd., March 17, 72 p. (Accessed July 16, 2024, via https://en.cmoc.com/html/2023/Performance_0423/70.html.)
- Companhia Brasileira de Metalurgia e Mineração, 2023, 2022 sustainability report—Operational and financial results: Araxá, Brazil, Companhia Brasileira de Metalurgia e Mineração, 86 p. (Accessed July 16, 2024, at https://cbmm.com/sustainability-report/public/pdf/cbmm_relatorio-de-sustentabilidade_2022_eng.pdf.)

¹Where necessary, values have been converted from Brazilian reais (BRL) to U.S. dollars (US\$) at the annual average exchange rate of 5.165=US\$1.00, for 2022.

- Defense Logistics Agency Strategic Materials, 2022a, Annual Materials Plan for FY 2023 (potential acquisitions): Fort Belvoir, VA, Defense Logistics Agency Strategic Materials announcement, DLA–SM–23–3220, October 4, 1 p. (Accessed June 21, 2022, via <https://www.dla.mil/HQ/Acquisition/StrategicMaterials/Reports/>.)
- Defense Logistics Agency Strategic Materials, 2022b, Annual Materials Plan for FY 2023 (potential disposals*): Fort Belvoir, VA, Defense Logistics Agency Strategic Materials announcement, DLA–SM–23–3219, October 4, 1 p. (Accessed June 19, 2024, via <https://www.dla.mil/HQ/Acquisition/StrategicMaterials/Reports/>.)
- DeMille, J.B., 1947, Strategic minerals—A summary of uses, world output, stockpiles, procurement: New York, NY, McGraw-Hill Book Co., Inc., 642 p. (Accessed July 2, 2018, at <https://ia801405.us.archive.org/24/items/strategicmineral031804mbp/strategicmineral031804mbp.pdf>.)
- Friedline, C.A., 2023, Niobium (Columbium): U.S. Geological Survey Mineral Commodity Summaries 2023, p. 124–125.
- JSC Solikamsk Magnesium Works, 2024, Issuer report for 12 months 2023: Solikamsk, Russia, JSC Solikamsk Magnesium Works, 57 p. (Accessed July 23, 2024, via <https://smw.ru/shareholder/everyear/>.)
- Magris Performance Materials Inc., 2023, Magris ESG report 2022: Saint-Honore, Quebec, Canada, Magris Performance Materials Inc., 30 p. (Accessed July 15, 2024, at <https://www.magrispm.com/s/Magris-2022-ESG-Update-1.pdf>.)
- MINSUR S.A., 2024, Memoria annual 2023 [Annual report 2023]: Lima, Peru, MINSUR S.A., 86 p. (Accessed July 16, 2024, at <https://www.minsur.com/wp-content/uploads/2024/05/memoria-anual-minsur-2023.pdf>.) [In Spanish.]
- Mordor Intelligence Pvt. Ltd., 2023a, Global niobium market 2023: Hyderabad, India, Mordor Intelligence Pvt. Ltd., 199 p.
- Mordor Intelligence Pvt. Ltd., 2023b, Market estimation sheet—Global niobium market (2018–2030): Hyderabad, India, Mordor Intelligence Pvt. Ltd.
- NioCorp Developments Ltd., 2022, Form 10–K—For the fiscal year ended June 30, 2022: Washington, DC, U.S. Securities and Exchange Commission, September 6, 128 p. (Accessed June 18, 2024, via <https://www.niocorp.com/investor-center/financials-reports/>.)
- Project Blue Group Ltd., 2024a, Niobium market service—Niobium analysis: London, United Kingdom, Project Blue Group Ltd., May 1, 15 p.
- Project Blue Group Ltd., 2024b, Niobium market service—Niobium interactive data (Q2–2024): London, United Kingdom, Project Blue Group Ltd., September 1.
- Roskill Information Services Ltd., 2021, Niobium—Market outlook to 2030 (16th ed.): London, United Kingdom, Roskill Information Services Ltd., 273 p.
- Tuck, C.C., 2023, Iron and steel: U.S. Geological Survey Mineral Commodity Summaries 2023, p. 92–93.
- U.S. Department of the Interior, 2022, 2022 final list of critical minerals: Federal Register, v. 87, no. 37, February 24, p. 10381–10382. (Accessed September 23, 2024, at <https://www.govinfo.gov/content/pkg/FR-2022-02-24/pdf/2022-04027.pdf>.)
- Zen Innovations AG, 2024, Global trade tracker: Bern-Kehrsatz, Switzerland, Zen Innovations AG database. (Accessed July 26, 2024, via <https://www.globaltradetracker.com>.)

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

- Historical Statistics for Mineral and Material Commodities in the United States. Data Series 140.
- Niobium (Columbium). Ch. in Mineral Commodity Summaries, annual.
- Niobium (Columbium) and Tantalum. International Strategic Minerals Inventory Summary Report, Circular 930–M, 1993.
- Niobium and Tantalum. Ch. in Critical Mineral Resources of the United States—Economic and Environmental Geology and Prospects for Future Supply, Professional Paper 1802, 2017.

Other

- Columbium (Niobium). Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.
- Company reports and press releases.
- Mining Journal, weekly.
- Platts Metals Week, weekly.
- Tantalum-Niobium International Study Center.

TABLE 1
SALIENT NIOBIUM STATISTICS¹

(Metric tons unless otherwise specified)

	2018	2019	2020	2021	2022	
United States:						
Exports:						
Niobium ores and concentrates, gross weight	5	27	4	5	6	
Synthetic concentrates, gross weight	198	40	120	238	43	
Tantalum ores and concentrates, gross weight	48	28	10	180	2	
Niobium-containing ores and concentrates, Nb content ²	18 ^r	10 ^r	10 ^r	30 ^r	4	
Ferroniobium, Nb content ²	926	655	777	962	663	
Total exports, Nb content	944 ^r	665 ^r	787 ^r	992 ^r	667	
Imports for consumption:						
Niobium ores and concentrates, gross weight	31	3	4	1	1	
Synthetic concentrates, gross weight	12	6	6	30	33	
Tantalum ores and concentrates, gross weight	1,050	840	693	1,300	1,260	
Niobium-containing ores and concentrates, Nb content ²	80 ^r	60 ^r	50 ^r	93 ^r	91	
Niobium metal, Nb content ³	1,800	1,690	1,220	1,250	1,990	
Niobium oxide, Nb content ²	964	994	519	750	781	
Ferroniobium, Nb content ²	8,290	7,330	5,380	6,140	6,250	
Total imports, Nb content	11,100 ^r	10,100	7,170 ^r	8,230 ^r	9,110	
Reported consumption, Nb content:						
Raw materials	W	W	W	W	W	
Ferroniobium and nickel niobium ³	6,860 ^r	6,700 ^r	6,190 ^r	6,110 ^r	7,230	
Apparent consumption, Nb content ⁴	10,100	9,330 ^r	6,300 ^r	7,240 ^r	8,440	
Unit value, ⁵ gross weight:						
Niobium ores and concentrates	dollars per kilogram	15.08	11.33	26.62	35.52	29.68
Niobium oxide	do.	35.03	35.42	33.58	34.20	36.00
Ferroniobium	do.	21.11	22.71	20.74	20.83	25.07
World, production of niobium concentrates, Nb content ⁶	78,600 ^r	96,900	67,500	87,500 ^r	83,700	

^rRevised. do. Ditto. W Withheld to avoid disclosing company proprietary data.

¹Table includes data available through October 10, 2023. Data are rounded to no more than three significant digits, except "Unit value"; may not add to totals shown.

²Includes natural and synthetic niobium-containing ores and concentrates. Niobium (Nb) content of ores and concentrates was estimated assuming the following niobium oxide (Nb₂O₅) contents: 28% in niobium ore, 10% in synthetic concentrates, and 10% in tantalum ore. The niobium content of ferroniobium was estimated to be 65%. The Nb content of Nb₂O₅ is 69.904%.

³Includes niobium and articles made of niobium.

⁴Defined as imports minus exports plus adjustments for Government stock changes for 2018–21. Beginning in 2022, Government stock changes were no longer included.

⁵Weighted average unit value of imported plus exported materials.

⁶May include estimated data.

Sources: U.S. Census Bureau and U.S. Geological Survey.

TABLE 2
 REPORTED CONSUMPTION, BY END USE, INDUSTRY STOCKS OF FERRONIUM AND
 NICKEL NIOBIUM IN THE UNITED STATES¹

(Metric tons, niobium content)

	2021	2022
End use:		
Steel:		
Carbon	1,040 ^r	(2)
Stainless and heat-resisting	348 ^r	286
Full alloy	284 ^r	321
High-strength low-alloy	(2)	(2)
Electric	(2)	(2)
Tool	(2)	(2)
Unspecified	2,570 ^r	2,740
Total	4,560 ^r	5,680
Superalloys	1,530 ^r	1,540
Alloys (excluding steels and superalloys)	17 ^r	17
Grand total	<u>6,110 ^r</u>	<u>7,230</u>
Stocks, December 31:		
Consumer	566	351
Producer ³	W	W
Total	566	351

^rRevised. W Withheld to avoid disclosing company proprietary data.

¹Table includes data available through July 14, 2023. Data are rounded to no more than three significant digits; may not add to totals shown.

²Included with "Steel, unspecified."

³Ferroniobium only.

TABLE 3
U.S. FOREIGN TRADE IN NIOBIUM, BY CLASS¹

Trade code ²	Class	2021		2022		Principal destinations and sources in 2022 (gross weight in metric tons and value in thousand dollars)
		Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)	
Exports:						
2615.90.3000	Synthetic concentrates	238	\$2,700	43	\$130	Mexico 40, \$90; Cambodia 2, \$40.
2615.90.6030	Niobium ores and concentrates	5	149	6	166	India 5, \$151.
2615.90.6060	Tantalum ores and concentrates ³	180	8,160	2	144	Belgium 2, \$129.
7202.93.0000	Ferriobium	1,480	15,700	1,020	11,100	Mexico 904, \$9,940; Canada 57, \$535.
	Total exports	XX	26,700	XX	11,600	
Imports for consumption:						
2615.90.3000	Synthetic concentrates	30	931	33	903	Singapore 27, \$863; Japan 7, \$33.
2615.90.6030	Niobium ores and concentrates	1	85	1	43	China 2, \$33.
2615.90.6060	Tantalum ores and concentrates ³	1,300	62,700	1,260	78,200	Australia 744, \$45,000; Congo (Kinshasa) 109, \$7,520; Rwanda 93, \$5,780.
2825.90.1500	Niobium oxide	1,070	36,700	1,120	40,200	Brazil 948, \$33,300; Estonia 100, \$3,590; India 31, \$1,220.
	Total ores, concentrates, and oxides	XX	100,000	XX	119,000	
Ferriobium:						
7202.93.4000	Silicon <0.4%	--	--	58	940	Brazil 58, \$940.
7202.93.8000	Other	9,450	212,000	9,550	254,000	Brazil 5,030, \$125,000; Canada 4,490, \$129,000.
	Total ferriobium	9,450	212,000	9,610	255,000	
8112.92.4000	Unwrought, powders ⁴	1,250	56,700	1,990	94,200	Brazil 1,760, \$79,400; Germany 98, \$5,060; Estonia 44, \$3,130; China 42, \$3,910.
	Total imports	XX	369,000	XX	469,000	

XX Not applicable. -- Zero.

¹Table includes data available through July 14, 2023. Data are rounded to no more than three significant digits; may not add to totals shown.

²Exports categorized as United States Schedule B. Imports categorized as Harmonized Tariff Schedule of the United States (HTS).

³Tantalum ores and concentrates, may contain niobium.

⁴Niobium waste and scrap is included in HTS code 8112.92.0600 along with other materials. Niobium other than powders, unwrought, and waste and scrap is included in HTS code 8112.99.9000 along with other materials.

Source: U.S. Census Bureau.

TABLE 4
 NIOBIUM: WORLD PRODUCTION OF MINERAL CONCENTRATES, BY COUNTRY OR LOCALITY^{1,2}

(Metric tons, niobium content)

Country or locality ³	2018	2019	2020	2021	2022
Brazil:					
Columbite-tantalite concentrate	2,682	2,559	2,495	2,655	2,600 ^e
Pyrochlore concentrate	66,910	86,374	57,324	76,075	73,000 ^e
Total	69,592	88,933	59,819	78,730	75,600
Burundi, ore and concentrate^e	43	38	30	46 ^r	29
Canada, pyrochlore concentrate^e	7,600	6,800	6,400	7,500	6,700
China, mineral concentrate	45	45 ^e	44	45 ^e	45 ^e
Congo (Kinshasa):^e					
Cassiterite concentrate	160	180	260	280 ^r	320
Columbite-tantalite concentrate	320 ^r	230	300	250 ^r	390
Total	480 ^r	410	560	530 ^r	710
Ethiopia, columbite-tantalite concentrate^e	26	7	7	12	11
Mozambique, columbite-tantalite concentrate	5 ^e	6 ^e	9	8 ^e	5 ^e
Nigeria, columbite-tantalite concentrate^e	89	40	35 ^r	35 ^r	35
Russia, loparite concentrate	467	461	432	453 ^r	381 ^e
Rwanda:					
Cassiterite concentrate ^e	43	35	26	28	39
Columbite-tantalite concentrate ^e	210	170	130	130	160
Total	253	205	156	158	199
Uganda, ore and concentrate^e	(4)	(4)	7	1 ^r	1
Grand total	78,600^r	96,900	67,500	87,500^r	83,700

^eEstimated. ^rRevised.

¹Table includes data available through September 6, 2023. All data are reported unless otherwise noted; totals may include estimated data. Grand totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Figures for all countries represent marketable output.

³In addition to the countries and (or) localities listed, Australia, French Guiana, and Malaysia may have produced niobium mineral concentrates, but available information was inadequate to make reliable estimates of output.

⁴Less than ½ unit.

TABLE 5
 FERRONIBIUM (FERROCOLUMBIUM): ESTIMATED WORLD PRODUCTION, BY COUNTRY OR LOCALITY¹

(Metric tons, niobium content)

Country or locality ²	2018	2019	2020	2021	2022
Brazil	59,000	60,000	58,300	67,000	63,000
Canada	7,400	6,600	6,200	7,400	6,600
Russia	290	400	370	350	360
Total	66,700	67,000	64,900	74,800	70,000

¹Estimated data are rounded to no more than three significant digits; may not add to totals shown.

²In addition to the countries and (or) localities listed, Austria, China, and Germany may have produced ferroniobium (ferrocolumbium), but available information was inadequate to make reliable estimates of output.