USGS
science for a changing world

2021 Minerals Yearbook

BERYLLIUM [ADVANCE RELEASE]

U.S. Department of the Interior
U.S. Geological Survey

April 2025

U.S. Geological Survey, Reston, Virginia: 2025

Beryllium

By Brian W. Jaskula

Domestic survey data and tables were prepared by Darlene V. Thompson, statistical assistant.

On the basis of estimated beryllium content, U.S. mine shipments of beryllium ore in 2021 increased to 175 metric tons (t) from 165 t in 2020, and reported consumption of ore for the production of beryllium hydroxide remained the same as 2020 at 170 t (table 1). U.S. shipments and consumption of beryllium ore were 35% and 39% lower, respectively, than the peak quantities in 2014 (fig. 1), most likely owing to a decrease of beryllium consumption in oil and gas exploration that took place in 2015 and 2016 (Materion Corp., 2016, p. 2, 24). On the basis of estimated beryllium content, imports of beryllium materials increased slightly and exports of beryllium metal increased by 22% in 2021 from those in 2020 (table 3). The large increase in exports was most likely due to increased beryllium sales in aerospace, automotive, industrial, and military end markets in 2021 (Materion Corp., 2022, p. 23).

In 2021, estimated world beryllium ore production increased by 8% compared with that in 2020 (table 4). The United States was the leading producer of mined beryllium, accounting for 64% of estimated world production. China was the second-ranked producer and accounted for 26%. Beryl, a principal mineral of beryllium mined outside of the United States, commonly was stockpiled for later processing, and sales or export data may not accurately reflect production. As a result, world production numbers and the U.S. share of world production have a high degree of uncertainty.

Beryllium is gray in color and is one of the lightest metals. Its physical and mechanical properties—outstanding stiffness-to-weight and strength-to-weight ratios, high melting point relative to other light metals, high specific heat, excellent thermal conductivity, outstanding dimensional stability over a wide range of temperatures, high reflectivity, lowest neutron absorption cross section of any metal and high neutron-scattering cross section, and transparency to X-rays—make it useful for many applications. Beryllium was used primarily in beryllium-copper alloys, beryllium oxide ceramics, and as beryllium metal in a wide variety of products, such as bearings and bushings, computer chip heat sinks, contacts and connectors, disc brakes, highly conductive and high-strength wire, mirrors, protective housings, switches and relays, and X-ray windows. Industries that used beryllium products included aerospace, automotive, computer, defense, electronics, energy, marine, medical, nuclear, and telecommunications.

The leading use for beryllium, which accounted for about 75% of total world consumption, was in copper-base alloys containing from 0.2% to 2.0% beryllium. Beryllium enhances the strength, stiffness, and hardness of copper alloys while retaining relatively good ductility, machinability, and electrical and thermal conductivity. Beryllium-copper alloys were formed predominantly into strip products used as electrical connectors, contacts, relays, electromagnetic radiation shielding, and switches, and as bulk products in the form of bars, plates, rods, and tubes. Oil and gas exploration equipment relied on beryllium alloy bearings, couplings, and instrument housings to drill under corrosive and high-stress, high-temperature conditions without sparking. The second leading use of beryllium, which consumed about 20% of total world production, was as 99.5%-pure (or greater) beryllium metal and beryllium-base alloys containing greater than 60% beryllium (primarily alloyed with aluminum). Beryllium metal and alloys typically were used to produce components for high-technology equipment where low density, low thermal distortion, and good machinability were critical factors. Beryllium oxide ceramics, which accounted for the remaining 5% of beryllium consumption, were used where electrical insulation and heat extraction were essential, such as automotive electrical systems and heat sinks for radar and radio-frequency equipment (Trueman and Sabey, 2014, p. 101–103).

Only two beryllium minerals are of commercial importance for the production of beryllium. Bertrandite, which can contain as much as 15% beryllium, was the principal beryllium mineral mined in the United States. Bertrandite ore mined in the United States contained about 0.25% beryllium by weight. Beryl, which can contain up to 5% beryllium, was the principal beryllium mineral mined in the rest of the world from ores typically grading 4% beryllium or less. Commercial beryl contains approximately 12% beryllium oxide, 19% aluminum oxide, 67% silicon dioxide, and 2% other oxides. Artisanal mining of the gemstone varieties of beryl, most notably aquamarine and emerald, was a primary source of byproduct beryl for beryllium extraction. More information on gem-quality beryl and chrysoberyl can be found in the Gemstones chapter of the U.S. Geological Survey (USGS) Minerals Yearbook, volume I, Metals and Minerals.

Government Actions and Legislation

Because beryllium is toxic, various international, national, and State guidelines and regulations have been established to determine and monitor allowable beryllium content in air, water, and other media. Industry regulations require control of the quantity of beryllium dust, fumes, and mists in the workplace and effluent discharges.

Defense Production Act.—To ensure current and future availability of high-quality domestic beryllium to meet critical defense needs, in 2008, the U.S. Department of Defense (DOD), under the Defense Production Act Title III Program, invested in a public-private partnership with Materion Corp. (Mayfield Heights, OH) to build a primary beryllium facility in Elmore, OH. The facility was designed to produce high-purity beryllium metal from beryllium hydroxide sourced from Materion's Delta, UT, operation. Approximately two-thirds of the facility's output was to be allocated for defense and Government-related end uses; the remaining output was to go to the private sector. The

plant, with a design capacity of 73 metric tons per year (t/yr) of beryllium metal, was placed into service in 2012 (Metal Bulletin, 2010; Materion Corp., 2022, p. 61).

National Defense Stockpile.—The Defense Logistics Agency Strategic Materials, DOD, offered and sold selected beryllium materials from the National Defense Stockpile (NDS). The Annual Materials Plan for fiscal year 2021, which represented the maximum quantities of beryllium metal that could be upgraded or disposed of from October 1, 2020, through September 30, 2021, was 7 t, the same as that in fiscal year 2020. In calendar year 2021, the NDS sold 7 t of beryllium hot-pressed metal powder. The NDS also upgrades beryllium hot-pressed metal powder into hot isostatic pressing structured metal powder to meet product specification for many modern DOD applications. NDS calendar yearend inventories of beryllium materials are listed in table 2 (U.S. Department of Defense, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, 2015, p. 5; Defense Logistics Agency Strategic Materials, 2020).

Production

Domestic production (tables 1, 4) and consumption data (table 1) for beryllium-containing ores were collected by the USGS from two voluntary surveys sent to the sole U.S. beryllium production operation, Materion. In 2021, Materion replied to the surveys. A small number of unidentified producers may have shipped minimal quantities of byproduct beryl, but these companies were not included in the survey or were not surveyed. In 2021, the only domestic beryllium mine shipped approximately 175 t of contained beryllium, 6% greater than shipments in 2020.

The United States was one of only three countries known to have processed beryllium ores and concentrates into beryllium products. The two other countries were China and Kazakhstan. Materion converted bertrandite from open pit mines in the Topaz-Spor Mountain region of Juab County, UT, into beryllium hydroxide at its operations near Delta, UT. Most of the beryllium hydroxide was shipped to Elmore, OH, where Materion converted it into beryllium-copper master alloy (BCMA), metal, or oxide. Historically, some beryllium hydroxide has been sold to NGK Insulators, Ltd. of Japan. In 2021, 100% of Materion's beryllium hydroxide was produced from bertrandite (Materion Corp., 2022, p. 30). Very-high-purity beryllium is produced exclusively from beryl, as beryl typically has fewer impurities (for example, fluorine and uranium) than bertrandite. Beryl-sourced high-purity beryllium was used in nuclear applications, where the absence of uranium in the beryllium allows for safe and timely disposal of nuclear waste containing beryllium, and in foil for use as X-ray windows for medical applications (Keith Smith, Vice President, Technology and Government Business Development, Materion Corp., oral commun., April 4, 2016).

Based on the expectation that worldwide stockpiles of beryllium concentrate were being depleted, Materion increased its capacity to produce beryllium hydroxide at its Delta, UT, plant in 2013 and invested $23 million to further develop its bertrandite pits in the Topaz-Spor Mountain region in 2015. In 2021, the capacity utilization of the Delta plant was 55%, 3% greater than that in 2020 (Materion Corp., 2014, p. 5; 2016, p. 2; 2022, p. 30).

Consumption

In 2021, U.S. reported consumption of bertrandite ore and beryl for the production of beryllium hydroxide was 170 t of beryllium content, the same as that in 2020 (table 1). U.S. apparent consumption of all beryllium materials in 2021, as calculated from mine shipments, net trade, and changes in Government and industry stocks, was estimated to be 196 t of beryllium content, the same as that in 2020. Beryllium mine shipments increased by 6% in 2021, and net imports decreased by 20%.

Materion produced beryllium hydroxide, beryllium products (including ceramics, metal, and metal-matrix composites), and beryllium strip and bulk products in its Performance Alloys and Composites segment. Materion produced two types of metal-matrix composites—one made from aluminum and beryllium and the other made from beryllium and beryllium oxide (BeO or beryllia). Foil, rod, sheet, tube, and a variety of customized shapes were produced at plants in Elmore, OH, and Fremont, CA. Beryllia ceramic products for aerospace, defense, electronics, medical, semiconductor, telecommunications, and wireless applications were produced at its plant in Tucson, AZ, and copper- and nickel-base alloy products, the majority of which contained beryllium, were produced at plants in Elmore, OH, and Shoemakersville, PA. These copper- and nickel-base alloy products included alloy strip products (which were used as connectors, contacts, relays, shielding, and switches) and alloy bulk products (including bar, plate, rod, tube, and customized forms).

In 2021, net sales from the Performance Alloys and Composites segment increased by 30% from those in 2020 owing to higher sales in most major end markets, with the largest increases in the aerospace and defense, automotive, and industrial end markets. In 2021, the Performance Alloys and Composites sales were distributed as follows: industrial, 24%; automotive, 21%; aerospace and defense, 17%; telecommunications and data center, 10%; consumer electronics applications, 8%; energy, 5%; semiconductor, 2%; and other, 13% (Materion Corp., 2022, p. 54).

IBC Advanced Alloys Corp. (Franklin, IN) manufactured beryllium-aluminum and beryllium-copper alloys and its proprietary beryllium alloys, which were castable beryllium-aluminum products, at plants located in Franklin, IN, and Wilmington, MA. IBC purchased beryllium from Materion and the NDS. IBC also had an agreement to purchase beryllium metal and BCMA from the Ulba Metallurgical Plant (UMP) in Kazakhstan lasting through 2021 (IBC Advanced Alloys Corp., 2022, p. 7, 20–21). The UMP was part of Kazatomprom JSC, the national operator for the nuclear industry in Kazakhstan.

Beryllium alloys also were manufactured domestically by Belmont Metals Inc. (Brooklyn, NY) and NGK Metals Corp. (Sweetwater, TN), a subsidiary of Japan's NGK Insulators, Ltd. American Beryllia Inc. (Haskell, NJ) manufactured beryllium oxide ceramic components and compound materials. American Elements (Los Angeles, CA) manufactured beryllium metal and beryllium oxide foil, sheet, and plate.

Recycling

Beryllium was recycled from new scrap generated during the manufacture of beryllium-containing components, as well as from old scrap collected from end users. Detailed data on the quantities of recycled beryllium were not available but may have been as much as 20% to 25% of U.S. consumption. Beryllium products manufactured by Materion from recycled metal required only 20% of the full-cycle (mine through manufacture) energy as that of beryllium products manufactured from primary material. Materion established a comprehensive recycling program for its beryllium products and indicated a 40%-beryllium recovery rate from processed new and old beryllium scrap (Stephen Freeman, President, International Business Development, Materion Corp., oral commun., August 2, 2012).

Foreign Trade

U.S. foreign trade in beryllium materials, as reported by the U.S. Census Bureau, is summarized in table 3. On the basis of estimated beryllium content, total beryllium imports increased slightly compared with those in 2020. The leading suppliers of beryllium materials to the United States, by beryllium content, were Kazakhstan, Latvia, and Japan. By gross weight, the leading suppliers of beryllium materials to the United States were Japan, Kazakhstan, and Germany.

On the basis of estimated beryllium content, beryllium exports increased by 22% compared with that in 2020. Canada was the leading recipient of exported beryllium metal, followed by Germany and France. The U.S. Census Bureau, however, only reported exported beryllium metal in its "Schedule B: Statistical Classification of Domestic and Foreign Commodities Exported from the United States." Exported BCMA and beryllium oxide and hydroxide did not have separate dedicated Schedule B numbers. According to Materion, BCMA typically accounted for 85% of domestic beryllium exports, whereas beryllium metal typically accounted for less than 15% of exports (Stephen Freeman, President, International Business Development, Materion Corp., oral commun., January 10, 2013).

Net import reliance as a percentage of apparent consumption is one measure of the adequacy of current domestic beryllium production to meet U.S. demand. Net import reliance is defined as imports minus exports plus adjustments for Government and industry stock changes. Included among stock changes are acquisitions or shipments from the NDS, regardless of whether the materials were imported or produced in the United States. Apparent consumption is defined as primary production plus secondary production from old scrap plus imports minus exports plus adjustments for Government and industry stock changes. For 2021, net import reliance as a percentage of apparent consumption for all forms of beryllium was 11%, a decrease from 16% in 2020. Net import reliance as a percentage of apparent consumption decreased since its peak of 61% in 2010 owing primarily to the startup and operation of a beryllium metal plant in 2012 (Jaskula, 2015). There has been a commensurate decrease in beryllium imports and Government stockpile shipments.

World Review

China.—Two facilities in China processed beryllium ores and concentrates into beryllium products—Hunan Shuikoushan Nonferrous Metals Group Co., Ltd. in Xinjiang Province and Fuyun Hengsheng Beryllium Industry Co., Ltd. in Guangdong Province. For 2020, Antaike Information Development Co., Ltd. estimated that China produced 70 t of beryllium from domestic beryl ore (1,750 t gross weight). Antaike also reported that China's apparent beryllium consumption in 2020 was 115 t of beryllium in the production of beryllium-copper alloys, beryllium oxide ceramics, and beryllium metal (Ying, 2020, p. 10, 15). For 2021, the USGS estimated that China's beryllium production and apparent beryllium consumption were about the same as in 2020. China, on average, sourced one-half of its beryllium from domestic ore and one-half from Kazakhstan and other foreign sources (China Mining Association, 2016). China was thought to be the world's second-ranked beryllium-processing country (after the United States), surpassing Kazakhstan (Ron Gilerman, Managing Director, A&R Merchants, Inc., oral commun., August 10, 2017).

Kazakhstan.—The UMP consumed 94.5 t of beryllium in the production of beryllium-copper alloys, beryllium oxide ceramics, and beryllium metal in 2017 (Kazatomprom JSC, 2018, p. 61–62). The USGS estimated that beryllium consumption was about 90 t in 2020, and about 92 t in 2021 owing to a 3% increase in Kazatomprom's production of beryllium-containing products in 2021, the majority of which typically contained 0.2% to 2.0% beryllium (Kazatomprom JSC, 2022, p. 6). Since the early 1990s, the UMP's production was sourced from beryllium concentrate stockpiled in Kazakhstan, which had accumulated prior to the breakup of the Soviet Union. The beryllium concentrate stockpile in Kazakhstan may have still been present in 2021 but was estimated by the USGS to be depleted or nearly depleted. The UMP's more recent primary source of beryllium concentrate was from a Soviet-era stockpile located in Russia. In 2017, the Russian stockpile was forecast to support about 20 years of production, based on the UMP's current rate of consumption (Ron Gilerman, Managing Director, A&R Merchants, Inc., oral commun., August 10, 2017).

In 2017, the last year for which data were reported, Ulba-China Co., Ltd., a Shanghai, China-based subsidiary of the UMP, accounted for 63% of Kazatomprom's sales of beryllium products by volume. The beryllium products were sold to customers in China, Japan, the Republic of Korea, and Malaysia. In addition, Germany's Tropag Oscar H. Ritter Nachf, GmbH; Japan's NGK Insulators, Ltd.; and IBC in the United States accounted for 18%, 10%, and 5%, respectively, of Kazatomprom's sales of beryllium products by volume (Kazatomprom JSC, 2018, p. 105).

Russia.—In an effort to augment the beryllium metal imported by Russia, JSC Mariinsky Mine, an enterprise located at the Malyshevskoye emerald-beryllium deposit in Sverdlovsk Province, announced plans in 2019 to produce beryllium metal by 2025. Gemstone beryl ore has been mined historically from this deposit. Mariinsky Mine planned to reconstruct the underground mine at the deposit and build beryllium-concentration and metal-production operations presumably in the town of Krasnoturinsk (ITAR-TASS News Agency, 2019).

A comprehensive geologic and economic assessment of the deposit was being conducted to assess its emerald-beryllium resources and reserves more accurately. The economic assessment was to be completed in 2022 (JSC Mariinsky Mine, 2020; VK, 2022).

Russia's Industry and Trade Ministry financed research on beryllium metal production. Tomsk Polytechnic University and the Rare Metals of Siberia Research and Production Association jointly produced a total of 1 kilogram of beryllium metal at yearend 2015. The Priargunsky Industrial Mining and Chemical Union in Krasnokamensk, Transbaikal Kray, was being considered for a concentrator, and the Siberian Chemical Combine in Seversk, Tomsk Province, was being considered for the beryllium hydrometallurgical plant. Bertrandite ore from the Ermakovskoe deposit in Buryatiya Republic was being considered for this project. As of 2015, the last year for which data were reported, planned production capacity was expected to be 30 t/yr of beryllium metal (Dragomanovich, 2015; ITAR-TASS News Agency, 2015; Tomsk Polytechnic University, 2017).

Russia's reopening of the Ermakovskoe bertrandite operation in the Siberian Republic of Buryatiya has been reported to be on hold owing to a 2014 financial downturn in Russia. Kazakhstan's UMP was expected to continue supplying Russia with beryllium products (Ron Gilerman, Managing Director, A&R Merchants, Inc., oral commun., August 10, 2017). Ermakovskoe was estimated by the USGS to be the largest identified beryllium deposit in Russia, with reported reserves of 1.4 million metric tons (Mt) of fluorine-beryllium ore (MBC Corp., 2009, 2011; Rusnano Corp., 2012).

Outlook

The United States is expected to remain self-sufficient with respect to most of its beryllium requirements. At yearend 2021, Materion reported proven reserves in Juab County, UT, of 7 Mt of bertrandite having an average grade of 0.245% beryllium and containing more than 17,000 t of beryllium, representing a minimum of 75 years of future production. The company's proven and probable reserves totaled more than 19,000 t of beryllium. Materion reported indicated resources of 1.4 Mt of bertrandite having an average grade of 0.128% beryllium and containing almost 1,700 t of beryllium. The company's indicated and inferred resources totaled 10,000 t of beryllium, and are exclusive of mineral reserves (Materion Corp., 2022, p. 29–30).

References Cited

China Mining Association, 2016, Three rare resources survey report—Rare earth metals, rare metals, scattered metals: China Mining Association, December 20. (Accessed January 23, 2018, at http://www.chinamining.org.cn/index.php?m=content&c=index&a=show&catid=6&id=19002.) [In Chinese.]

Defense Logistics Agency Strategic Materials, 2020, Annual Materials Plan for FY 2021: Fort Belvoir, VA, Defense Logistics Agency Strategic Materials announcement, October 4, 1 p. (Accessed May 19, 2022, at https://www.dla.mil/Portals/104/Documents/Strategic%20Materials/Announcements/3182%20FY21%20AMP.pdf?ver=8es2CexNU2-8oJ6yaicyyg%3d%3d.)

Dragomanovich, Vanya, 2015, Russia plans industrial beryllium production by 2020: Metal-Pages, February 23. (Accessed December 28, 2017, via https://metals.argusmedia.com.)

IBC Advanced Alloys Corp., 2022, Management's discussion and analysis—Six months ended December 31, 2021: Franklin, IN, IBC Advanced Alloys Corp., March 1, 26 p. (Accessed March 10, 2023, at https://ibcadvancedalloys.com/wp-content/uploads/2022/02/FY2022-Q2-IBC-MDA.pdf.)

ITAR-TASS News Agency, 2015, Russia to design its first beryllium production in 2016: Moscow, Russia, ITAR-TASS News Agency, December 17. (Accessed December 18, 2015, at http://www.tass.ru/en/economy/844711.)

ITAR-TASS News Agency, 2019, Ural emerald producer plans to produce strategic metal beryllium: Moscow, Russia, ITAR-TASS News Agency, May 15. (Accessed April 7, 2020, at https://tass.ru/ural-news/6431308.)

Jaskula, B.W., 2015, Beryllium: U.S. Geological Survey Mineral Commodity Summaries 2015, p. 28–29.

JSC Mariinsky Mine, 2020, Mariinsky Mine conducts a comprehensive revaluation of the field: Asbest, Sverdlovsk Region, Russia, JSC Mariinsky Mine press release, December 14. (Accessed October 26, 2021, at https://marmine.ru/news/mariinskiy_priisk_provodit_kompleksnuyu_pereotsenku_mestorojdeniya.)

Kazatomprom JSC, 2018, Registration document: Morningstar Inc., October 15, 213 p. plus appendixes. (Accessed November 16, 2018, at http://tools.morningstar.co.uk/tsweu6nqxu/globaldocuments/document/documentHandler.ashx?DocumentId=187243829.)

Kazatomprom JSC, 2022, Integrated annual report NAC Kazatomprom JSC 2021: Nur-Sultan, Kazakhstan, Kazatomprom JSC, 386 p. (Accessed March 10, 2023, at https://ar2021.kazatomprom.kz/download/KAP-2021-en.pdf.)

Materion Corp., 2014, 2013 annual report—Leveraging our strengths: Mayfield Heights, OH, Materion Corp., 122 p. (Accessed June 8, 2017, at https://s24.q4cdn.com/750845857/files/doc_financials/annuals/Materion-Annual-2013.pdf.)

Materion Corp., 2016, 2015 annual report—Strong, disciplined, well positioned: Mayfield Heights, OH, Materion Corp., 100 p. (Accessed July 19, 2016, at https://s24.q4cdn.com/750845857/files/doc_financials/annuals/mtrn2015-annual-report.pdf.)

Materion Corp., 2022, 2021 annual report: Mayfield Heights, OH, Materion Corp., 89 p. (Accessed September 25, 2022, at https://s24.q4cdn.com/750845857/files/doc_financials/2021/ar/Materion-Annual-Report-10K-Wrap.pdf.)

MBC Corp., 2009, Ermakovskoe deposit: Moscow, Russia, MBC Corp. (Accessed December 20, 2012, at http://www.mbc-corp.com/eng/activity/gorsector/ermak/index.wbp.)

MBC Corp., 2011, A plant for beryllium ore hydrometallurgical concentrating is to be built in Buryatia: Moscow, Russia, MBC Corp. press release, August 12. (Accessed October 2, 2011, at http://www.mbc-corp.com/eng/presscenter/news/article.wbp?article_id=b86ebe1c-d684-4b90-9ea4-634570938ad2.)

Metal Bulletin, 2010, Brush Wellman set to commission beryllium plant: Metal Bulletin, August 6. (Accessed September 20, 2010, via http://www.metalbulletin.com/.)

Rusnano Corp., 2012, Rusnano and East-Siberian Metals invest in high-tech materials of beryllium: Moscow, Russia, Rusnano Corp. press release, February 22. (Accessed March 15, 2012, at http://www.en.rusnano.com/press-centre/news/88611.)

Tomsk Polytechnic University, 2017, Beryllium production based on TPU technology will be launched in 2019: Tomsk, Russia, Tomsk Polytechnic University news release, January 26. (Accessed June 3, 2017, at https://tpu.ru/en/about/tpu_today/news/view?id=1161.)

Trueman, D.L., and Sabey, Phillip, 2014, Beryllium, chap. 5 *of* Gunn, Gus, ed., Critical metals handbook: Oxford, United Kingdom, John Wiley & Sons, Ltd. Publishers, p. 99–121. (Accessed May 8, 2023, at https://onlinelibrary.wiley.com/doi/epdf/10.1002/9781118755341.ch5eryllium (wiley.com).)

U.S. Department of Defense, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, 2015, Strategic and critical materials operations report to Congress—Operations under the Strategic and Critical Materials Stockpiling Act during fiscal year 2014: Fort Belvoir, VA, U.S. Department of Defense, January, 70 p. (Accessed May 8, 2023, at https://www.dla.mil/Portals/104/Documents/Strategic%20Materials/Reports/Operations%20Report/2014%20Operations%20Report.pdf?ver=Q2jSCuw1IDm2__cRIX-G7A%3d%3d.)

VK, 2022, JSC "Marinsky Mine" presented a program for the further development of the emerald beryllium deposit Malysheveskoe: VK, November 26. (Accessed March 10, 2023, at https://vk.com/wall-158504201_3184?lang=en 1.) [In Russian.]

Ying, Liu, 2020, Market development of China's non-ferrous metal industry in 2019—Beryllium: Beijing, China, Antaike Information Development Co., Ltd. [or Antaike], January, 16 p. [In Chinese.]

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

Beryllium. Ch. in Critical Mineral Resources of the United States—Economic and Environmental Geology and Prospects for Future Supply, Professional Paper 1802, 2017.
Beryllium. Ch. in Mineral Commodity Summaries, annual.
Beryllium (Be). Ch. in Metal Prices in the United States Through 2010, Scientific Investigations Report 2012–5188, 2013.
Beryllium Recycling in the United States in 2000. Circular 1196–P, 2004.
Historical Statistics for Mineral and Material Commodities in the United States. Data Series 140.

Other

Beryllium. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.
Defense Logistics Agency Strategic Materials.
Roskill Information Services Ltd.

TABLE 1
SALIENT BERYLLIUM MINERAL STATISTICS[1]

(Metric tons, beryllium content)

	2017	2018	2019	2020	2021
United States, beryllium-containing ores:					
Mine shipments[2]	150	165	160	165	175
Imports for consumption, beryl[3]	5	2	(4)	--	(4)
Consumption, reported[5]	160	170	160	170	170
Stocks, December 31:					
Industry[2]	30	30	35	30	35
U.S. Government, beryl[3, 6]	(4)	(4)	(4)	(4)	(4)
World, production[3, 7]	210	256	238	253	272

-- Zero.
[1]Table includes data available through June 23, 2022.
[2]Data are rounded to the nearest 5 metric tons.
[3]Based on a beryllium content of 4%.
[4]Less than ½ unit.
[5]Data are rounded to the nearest 10 metric tons.
[6]Source: Defense Logistics Agency Strategic Materials.
[7]May include estimated data.

TABLE 2
U.S. GOVERNMENT NATIONAL DEFENSE STOCKPILE BERYLLIUM STATISTICS IN 2021[1]

(Metric tons, beryllium content)

Material	Annual Materials Plan	Inventory, December 31
Beryl ore[2]	--	(3)
Beryllium metal:		
Hot-pressed powder	(4)	51
Rods	--	(3)
Structural powder	--	7
Vacuum-cast	(4)	6
Total	7	64
Grand total	7	64

-- Zero.
[1]Table includes data available through June 23, 2022. Data were converted from gross weight reported in short tons; may not add to totals shown.
[2]Based on a beryllium content of 4%.
[3]Less than ½ unit.
[4]Annual Materials Plan for beryllium metal included in "Total."

Source: Defense Logistics Agency Strategic Materials.

TABLE 3
U.S. FOREIGN TRADE OF BERYLLIUM MATERIALS, BY TYPE[1]

Type and material	HTS[2] and Schedule B numbers	2020 Gross weight (kilograms)	2020 Content[e, 3] (kilograms)	2020 Value (thousands)	2021 Gross weight (kilograms)	2021 Content[e, 3] (kilograms)	2021 Value (thousands)	Principal destinations or sources based on gross weight, 2021
Exports:								
Beryllium, unwrought[4]	8112.12.0000	5,250	5,250	$223	5,700	5,700	$243	France, 45%; Germany, 21%; United Kingdom, 14%; Taiwan, 7%; Dominican Republic, 6%; Republic of Korea, 4%.
Beryllium waste and scrap	8112.13.0000	4,000	4,000	177	--	--	--	--
Beryllium, other[5]	8112.19.0000	15,700	15,700	19,700	24,700	24,700	26,600	Canada, 51%; Germany, 12%; Japan, 12%; Singapore, 8%; France, 4%; Republic of Korea, 4%.
Total		24,900	24,900	20,100	30,400	30,400	26,800	Canada, 41%; Germany, 14%; France, 12%; Japan, 10%; Singapore, 6%; United Kingdom, 5%; Republic of Korea, 4%.
Imports for consumption:								
Beryllium ores and concentrates[6]	2617.90.0030	--	--	--	6,090	244	6	Brazil, 100%.
Beryllium oxide and hydroxide	2825.90.1000	533	192	21	6,990	2,520	73	Spain, 79%; Republic of Korea, 14%; China, 7%.
Beryllium, unwrought[4]	8112.12.0000	--	--	--	--	--	--	--
Beryllium waste and scrap	8112.13.0000	1,430	1,430	5	66	66	5	Canada, 100%.
Beryllium, other[5]	8112.19.0000	36,400	36,400	2,980	38,000	38,000	5,320	Kazakhstan, 49%; Latvia, 31%; Canada, 8%; Ukraine, 6%;
Beryllium-copper master alloy	7405.00.6030	75,400	3,020 r	1,850	60,500	2,420	1,640	Kazakhstan, 89%; Germany, 10%.
Beryllium-copper plates, sheets, and strip	7409.90.1030, 7409.90.5030, 7409.90.9030	450,000	6,750	8,180	366,000	5,480	7,690	Japan, 89%; Germany, 11%.
Total		564,000	47,800	13,000	477,000	48,800	14,700	Japan, 68%; Kazakhstan, 18%; Germany, 4%; Latvia, 4%.

[e]Estimated. [r]Revised. -- Zero.
[1]Table includes data available through June 13, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Harmonized Tariff Schedule of the United States (HTS) codes are imports and Schedule B numbers of the United States are exports.
[3]Estimated from gross weight.
[4]Includes powders.
[5]Includes articles not elsewhere specified.
[6]Data verified by U.S. Census Bureau.

Source: U.S. Census Bureau.

TABLE 4
BERYL: WORLD PRODUCTION, BY COUNTRY OR LOCALITY[1, 2]

(Metric tons, gross weight)

Country or locality[3]	2017	2018	2019	2020	2021
Brazil[e]	80	80	80	80	80
China	1,300	1,725	1,750	1,750 [e]	1,750 [e]
Madagascar[e, 4]	16	16	16	16	16
Mozambique	53	381	45	80	330
Nigeria	18 [e]	35	35 [e]	35 [e]	35 [e]
Rwanda[e]	20	20	20	20	20
Uganda	--	24	15	190	190 [e]
United States[5]	3,760	4,130	3,990	4,150	4,370
Total	5,240	6,400 [r]	5,950	6,320	6,790

[e]Estimated. [r]Revised. -- Zero.

[1]Table includes data available through June 30, 2021. All data are reported unless otherwise noted; totals may include estimated data. Totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Unless otherwise noted, figures represent beryl ore for the production of beryllium and exclude gem-quality beryl.

[3]In addition to the countries and (or) localities listed, Kazakhstan, Portugal, and Russia 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.

[4]Beryl in quartz concentrates.

[5]Includes raw bertrandite ore, calculated as equivalent to beryl containing 11% beryllium oxide.

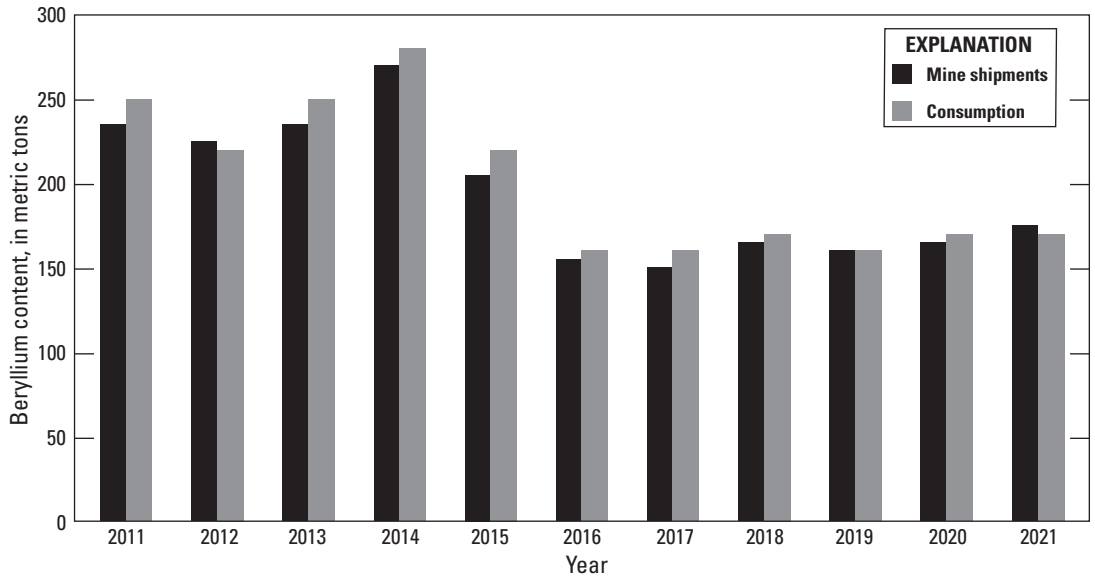

Figure 1. U.S. mine shipments and consumption of beryllium from 2011 through 2021.