

BERYLLIUM

(Data in metric tons of beryllium content unless otherwise noted)

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. Based on the estimated unit value for beryllium in imported beryllium-copper master alloy, beryllium apparent consumption of 210 tons was valued at about \$107 million. Based on value-added sales revenues, approximately 21% of beryllium products were used in industrial components, 20% in consumer electronics, 16% in automotive electronics, 12% in defense applications, 9% in telecommunications infrastructure, 5% in energy applications, 2% in medical applications, and 15% in other applications. Beryllium alloy strip and bulk products, the most common forms of processed beryllium, were used in all application areas. The majority of unalloyed beryllium metal and beryllium composite products were used in defense and scientific applications.

Salient Statistics—United States:	2012	2013	2014	2015	2016^e
Production, mine shipments	225	235	270	205	190
Imports for consumption ¹	100	57	68	66	51
Exports ²	55	35	26	29	32
Government stockpile releases ³	(4)	10	1	1	1
Consumption:					
Apparent ⁵	265	262	318	233	210
Reported, ore	220	250	280	220	200
Unit value, annual average, beryllium-copper master alloy, dollars per pound contained beryllium ⁶	204	208	215	220	231
Stocks, ore, consumer, yearend	15	20	15	25	25
Net import reliance ⁷ as a percentage of apparent consumption	15	10	15	12	10

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 are not available but may account for as much as 20% to 25% of total beryllium consumption. The leading U.S. beryllium producer established a comprehensive recycling program for all of its beryllium products, recovering approximately 40% of the beryllium content of the new and old beryllium alloy scrap. Beryllium manufactured from recycled sources requires only 20% of the energy as that of beryllium manufactured from primary sources.

Import Sources (2012–15):¹ Kazakhstan, 43%; Japan, 13%; United Kingdom, 9%; China, 9%; and other, 26%.

Tariff: Item	Number	Normal Trade Relations 12–31–16
Beryllium ores and concentrates	2617.90.0030	Free.
Beryllium oxide and hydroxide	2825.90.1000	3.7% ad val.
Beryllium-copper master alloy	7405.00.6030	Free.
Beryllium:		
Unwrought, including powders	8112.12.0000	8.5% ad val.
Waste and scrap	8112.13.0000	Free.
Other	8112.19.0000	5.5% ad val.

Depletion Allowance: 22% (Domestic), 14% (Foreign).

Government Stockpile: The Defense Logistics Agency Strategic Materials had a goal of retaining 47 tons of beryllium metal in the National Defense Stockpile.

Stockpile Status—9–30–16⁸

Material	Inventory	Disposal Plan FY 2016	Disposals FY 2016
Beryl ore	1	—	—
Metal	72	14	3
Structured powder	4	—	—

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Events, Trends, and Issues: Apparent consumption of beryllium-based products was estimated to have decreased by about 10% in 2016 from that of 2015, and by 34% from that in 2014. During the first 6 months of 2016, the leading U.S. beryllium producer reported that net sales of its beryllium alloy strip/bulk products and beryllium metal/composite products were 11% lower than those during the first 6 months of 2015. Sales of beryllium products to the energy market decreased owing to a significant decline in activity in the oil and gas sector. Sales of beryllium hydroxide, and beryllium products to the automotive electronics, consumer electronics, and industrial components markets, also decreased. Sales of beryllium products to the defense industry increased, most likely owing to Government spending on previously delayed defense programs. In recent years, beryl production in Mozambique has decreased, while beryl production in Madagascar has increased.

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:

	Mine production ^e		Reserves ⁹
	<u>2015</u>	<u>2016</u>	
United States	205	190	The United States has very little beryl that can be economically hand sorted from pegmatite deposits. The Spor Mountain area in Utah, an epithermal deposit, contains a large bertrandite resource, which is being mined. Proven bertrandite reserves in Utah total about 14,000 tons of contained beryllium. World beryllium reserves are not available.
China	20	20	
Madagascar	5	5	
Other countries	<u>1</u>	<u>1</u>	
World total (rounded)	230	220	

World Resources: 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 size, 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.

^eEstimated. — Zero.

¹Includes 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 semifabricates.

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

³Change in total inventory level from prior yearend inventory.

⁴Less than ½ unit.

⁵The sum of U.S. mine shipments and net import reliance.

⁶Calculated from gross weight and customs value of imports; beryllium content estimated to be 4%.

⁷Defined as imports – exports + adjustments for Government and industry stock changes.

⁸See [Appendix B](#) for definitions.

⁹See [Appendix C](#) for resource and reserve definitions and information concerning data sources.