

## BERYLLIUM

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

**Domestic Production and Use:** One company in Utah mined bertrandite ore, which it converted, along with imported beryl and beryl from the National Defense Stockpile, into beryllium hydroxide. Some of the beryllium hydroxide was shipped to the company's plant in Ohio, where it was converted into beryllium-copper master alloy, metal, and/or oxide—some of which was sold. Estimated beryllium consumption of 320 tons was valued at about \$160 million, based on the estimated unit value for beryllium in imported beryllium-copper master alloy. Based on sales revenues, more than one-half of beryllium use was estimated to be in computer and telecommunications products, and the remainder was used in aerospace and defense applications, appliances, automotive electronics, industrial components, medical devices, and other applications.

<b>Salient Statistics—United States:</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010<sup>e</sup></b>
Production, mine shipments <sup>e</sup>	155	150	175	120	170
Imports for consumption <sup>1</sup>	62	72	70	21	200
Exports <sup>2</sup>	135	101	112	23	40
Government stockpile releases <sup>3</sup>	158	36	39	19	29
Consumption:					
Apparent <sup>4</sup>	226	107	211	167	320
Reported, ore	180	190	220	150	290
Unit value, average annual, beryllium-copper master alloy, dollars per pound contained beryllium <sup>5</sup>	128	144	159	154	230
Stocks, ore, consumer, yearend	50	100	60	30	70
Net import reliance <sup>6</sup> as a percentage of apparent consumption	<sup>7</sup> 31	E	17	28	47

**Recycling:** Beryllium was recycled mostly from new scrap generated during the manufacture of beryllium products. Detailed data on the quantities of beryllium recycled are not available but may represent as much as 10% of apparent consumption.

**Import Sources (2006–09):**<sup>1</sup> Kazakhstan, 57%; Kenya, 10%; Germany, 9%; Ireland, 8%; and other, 16%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Normal Trade Relations 12-31-10</b>
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, U.S. Department of Defense, had a goal of retaining 45 tons of hot-pressed beryllium powder in the National Defense Stockpile. Disposal limits for beryllium materials in the fiscal year 2010 Annual Materials Plan are as follows: beryl ore, 1 ton, and beryllium metal, 54 tons of contained beryllium. The 2011 Annual Materials Plan's publishing date was delayed by the Defense Logistics Agency.

### Stockpile Status—9-30-10<sup>8</sup>

<b>Material</b>	<b>Uncommitted inventory</b>	<b>Authorized for disposal</b>	<b>Disposal plan FY 2010</b>	<b>Disposals FY 2010</b>
Beryl ore (11% BeO)	—	—	(9)	—
Beryllium-copper master alloy	—	—	—	—
Beryllium metal:				
Hot-pressed powder	97	52	—	36
Vacuum-cast	14	14	54	2

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**Events, Trends, and Issues:** Market conditions improved considerably for beryllium-based products in 2010. During the first half of 2010, the leading U.S. beryllium producer reported volume shipments of strip and bulk beryllium-copper alloy products to be 100% and 62% higher, respectively, than those during the first half of 2009. Sales of beryllium products for key markets, including aerospace, automotive electronics, ceramics, computer and telecommunications, medical and industrial x-ray equipment, and oil and gas, were substantially higher than those during the first half of 2009. Sales of beryllium products for defense-related applications were slightly higher in the first half of 2010 compared with those of the first half of 2009. The strong sales growth in 2010 was also due in part to higher beryllium prices and replenishment of supply chain inventories that were drawn down in 2009.

In an effort to ensure current and future availability of high-quality domestic beryllium to meet critical defense and commercial needs, the U.S. Department of Defense in 2005, under the Defense Production Act, Title III, invested in a public-private partnership with the leading U.S. beryllium producer to build a new \$90.4 million primary beryllium facility in Ohio. Construction of the facility was completed in 2010. Approximately two-thirds of the facility's output was to be allocated for defense and government-related end uses; the remaining output going to the private sector. Plant capacity was reported at 160,000 pounds per year of high-purity beryllium metal to meet Defense requirements. Primary beryllium facilities, the last of which closed in the United States in 2000, traditionally produced the feedstock used to make beryllium metal products.

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, which adds to the final cost of beryllium products.

### **World Mine Production and Reserves:**

	Mine production <sup>e</sup>		Reserves <sup>10</sup>
	<u>2009</u>	<u>2010</u>	
United States	120	170	The United States has very little beryl that can be economically handsorted from pegmatite deposits. The Spor Mountain area in Utah, an epithermal deposit, contains a large bertrandite resource, which was being mined. Proven bertrandite reserves in Utah total about 15,900 tons of contained beryllium. World beryllium reserves are not sufficiently well delineated to report consistent figures for all countries.
China	20	20	
Mozambique	2	2	
Other countries	<u>1</u>	<u>1</u>	
World total (rounded)	144	190	

**World Resources:** World resources in known deposits of beryllium have been estimated to be more than 80,000 tons. About 65% of these resources is in nonpegmatite deposits in the United States—the Gold Hill and Spor Mountain areas in Utah and the Seward Peninsula area in Alaska 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 in some applications.

<sup>e</sup>Estimated. E Net exporter. — Zero.

<sup>1</sup>Includes estimated beryllium content of imported ores and concentrates, oxide and hydroxide, unwrought metal (including powders), beryllium articles, waste and scrap, and beryllium-copper master alloy.

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

<sup>3</sup>Change in total inventory level from prior yearend inventory.

<sup>4</sup>The sum of U.S. mine shipments and net import reliance.

<sup>5</sup>Calculated from gross weight and customs value of imports; beryllium content estimated to be 4%.

<sup>6</sup>Defined as imports – exports + adjustments for Government and industry stock changes.

<sup>7</sup>Significant releases of beryl from the National Defense Stockpile resulted in a positive net import reliance as a percentage of apparent consumption in 2006.

<sup>8</sup>[See Appendix B for definitions.](#)

<sup>9</sup>Less than ½ unit.

<sup>10</sup>[See Appendix C for resource/reserve definitions and information concerning data sources.](#)