

BERYLLIUM

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

Domestic Production and Use: A company in Utah mined bertrandite ore and recovered beryllium hydroxide from this ore and from imported beryl. The beryllium hydroxide was shipped to a plant in Ohio, where it was converted into beryllium metal, alloys, and oxide. Beryllium consumption of 220 tons was valued at about \$80 million, based on the quoted producer price for beryllium-copper master alloy. The use of beryllium (as an alloy, metal, and oxide) in electronic and electrical components and aerospace and defense applications accounted for an estimated 80% of total consumption.

| Salient Statistics—United States: | 2000 | 2001 | 2002 | 2003 | 2004^e |
|---|-------------|-------------|-------------|-------------|-------------------------|
| Production, mine shipments | 180 | 100 | 80 | 85 | 100 |
| Imports for consumption, ore and metal | 20 | 115 | 150 | 60 | 90 |
| Exports, metal | 35 | 60 | 120 | 40 | 80 |
| Government stockpile releases ^{e, 1} | 220 | 60 | 60 | 50 | 145 |
| Consumption: | | | | | |
| Apparent | 300 | 230 | 180 | 200 | 220 |
| Reported, ore | 240 | 170 | 120 | 140 | NA |
| Price, dollars (yearend): | | | | | |
| Domestic, metal, vacuum-cast ingot, per pound | 421 | 338 | NA | NA | NA |
| Domestic, metal, powder blend, per pound ² | 492 | 375 | 375 | 375 | NA |
| Domestic, beryllium-copper master alloy, per pound of contained beryllium | 160 | 160 | 160 | 160 | 160 |
| Domestic, beryllium oxide, powder, per pound | 100 | 100 | NA | NA | NA |
| Stocks, consumer, yearend | 115 | 100 | 90 | 45 | NA |
| Net import reliance ³ as a percentage of apparent consumption | 37 | 57 | 56 | 58 | 55 |

Recycling: Beryllium was recycled mostly from new scrap that was generated during the manufacture of beryllium-related components. Detailed data on the quantities of beryllium recycled are not available but may be as much as 10% of apparent consumption.

Import Sources (2000-03): Ore, metal, scrap, and master alloy: Kazakhstan, 28%; Japan, 24%; Brazil, 10%; Spain, 6%; and other, 32%.

| Tariff: Item | Number | Normal Trade Relations 12-31-04 |
|---------------------------------|---------------|--|
| Beryllium ores and concentrates | 2617.90.0030 | Free. |
| Beryllium oxide or hydroxide | 2825.90.1000 | 3.7% ad val. |
| Beryllium-copper master alloy | 7405.00.6030 | Free. |
| Beryllium: | | |
| Unwrought 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:

Stockpile Status—9-30-04⁴

| Material | Uncommitted inventory | Committed inventory | Authorized for disposal | Disposal plan FY 2004 | Disposals FY 2004 |
|-------------------------------|------------------------------|----------------------------|--------------------------------|------------------------------|--------------------------|
| Beryl ore (11% BeO) | 149 | 60 | 149 | ⁵ 145 | 112 |
| Beryllium-copper master alloy | — | 37 | — | ⁵ 44 | 14 |
| Beryllium metal: | | | | | |
| Vacuum-cast | 59 | 23 | 59 | 36 | 249 |
| Hot-pressed powder | 155 | — | 110 | — | — |

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Events, Trends, and Issues: For the first half of 2004, sales of alloy products (strip and bulk) were reported to have increased compared with those of the previous year, owing to strong global demand for beryllium products from the automotive (particularly in Europe), industrial, and telecommunications and computer sectors. Sales of beryllium products, mostly for defense and government, electronics, and medical-related applications, increased slightly. In 2004, U.S. imports for consumption of beryllium increased; Ireland, Japan, Kazakhstan, and the United Kingdom were the leading suppliers. Beryllium exports also increased; Canada, France, Germany, Japan, and the United Kingdom were the major recipients of the materials.

For fiscal year 2004, the Defense National Stockpile Center (DNSC), Defense Logistics Agency, disposed of about 2,790 tons of beryl ore (about 112 tons of beryllium content), about 350 tons of beryllium-copper master alloy (BCMA) (about 14 tons of beryllium content), and about 249 tons of beryllium metal from the National Defense Stockpile. For fiscal year 2005, the DNSC announced maximum disposal limits of about 3,630 tons⁵ of beryl ore (about 145 tons of beryllium content), about 1,090 tons⁵ of BCMA (about 44 tons of beryllium content), and about 36 tons of beryllium metal.

Because of the toxic nature of beryllium, the industry must maintain careful control of the quantity of beryllium dust and fumes in the workplace. The U.S. Environmental Protection Agency issues standards for certain hazardous air pollutants, including beryllium, under the Clean Air Act, and the Occupational Safety and Health Administration (OSHA) issues standards for airborne beryllium particles. To comply with these standards, plants are required to install and maintain pollution-control equipment. In beryllium-processing plants, harmful effects are prevented by maintaining clean workplaces; requiring the use of safety equipment, such as personal respirators; collecting dust, fumes, and mists at the source; establishing medical programs; and implementing other procedures to provide safe working conditions. Standards for exposure to beryllium were under review by OSHA and private standard-setting organizations. Control of potential health hazards adds to the final cost of beryllium products.

World Mine Production, Reserves, and Reserve Base:

| | Mine production ⁶ | | Reserves and reserve base ⁶ |
|--------------------------|------------------------------|------|---|
| | 2003 | 2004 | |
| United States | 85 | 100 | The United States has very little beryl that can be economically handsorted from pegmatite deposits. The Spor Mountain area, Utah, an epithermal deposit, contains a large reserve base of bertrandite, which was being mined. Proven bertrandite reserves in Utah total about 16,000 tons of beryllium. The world reserves and reserve base are not sufficiently well delineated to report consistent figures for all countries. |
| China | 15 | 15 | |
| Kazakhstan | 4 | 4 | |
| Mozambique | 3 | 3 | |
| Russia | 40 | 40 | |
| Other countries | 1 | 1 | |
| World total ⁷ | 148 | 163 | |

World Resources: World resources of beryllium have been estimated to be more than 80,000 tons (contained mostly in known nonpegmatite deposits). About 65% of the beryllium resources is concentrated in the United States; the Spor Mountain and Gold Hill 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. Graphite, steel, and titanium may be substituted for beryllium metal in some applications, and phosphor bronze may be substituted for beryllium-copper alloys, but these substitutions can result in substantial loss in performance. In some applications, aluminum nitride may be substituted for beryllium oxide.

⁶Estimated. NA Not available. — Zero.

¹Net quantity (uncommitted inventory).

²This price quote was discontinued in February 2003.

³Defined as imports – exports + adjustments for Government and industry stock changes.

⁴See [Appendix B](#) for definitions.

⁵Actual quantity limited to remaining sales authority or inventory.

⁶See [Appendix C](#) for definitions.

⁷Other beryllium-producing countries include Brazil, Madagascar, Portugal, and Zambia.