

BISMUTH

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

Domestic Production and Use: The United States ceased production of primary refined bismuth in 1997 and is thus highly import dependent for its supply. A small amount of bismuth is recycled by some domestic firms. Bismuth is contained in some lead ores mined domestically, but the bismuth-containing residues are not processed domestically and may be exported. The value of bismuth consumed was approximately \$16 million. About 46% of the bismuth was used in fusible alloys, solders, and ammunition cartridges; 29% in metallurgical additives; 24% in pharmaceuticals and chemicals; and 1% in other uses.

The Safe Drinking Water Act Amendment of 1996 required that all new and repaired fixtures and pipes for potable water supply be lead-free after August 1998. Bismuth use in water meters is one particular application that has increased. An application with major growth potential is the use of zinc-bismuth alloys to achieve thinner and more uniform galvanization. Bismuth was also used domestically in the manufacture of ceramic glazes, crystal ware, and pigments.

<u>Salient Statistics—United States:</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004^e</u>
Production, refinery	—	—	—	—	—
Imports for consumption, metal	2,410	2,220	1,930	2,320	2,100
Exports, metal, alloys, and scrap	491	541	131	108	120
Consumption, reported	2,130	2,200	2,320	2,120	2,400
Price, average, domestic dealer, dollars per pound	3.70	3.74	3.14	2.87	3.10
Stocks, yearend, consumer	118	95	111	278	130
Net import reliance ¹ as a percentage of apparent consumption	95	95	95	95	90

Recycling: All types of bismuth-containing alloy scrap were increasingly recycled and contributed about 10% of the U.S. bismuth consumption, or 240 tons.

Import Sources (2000-03): Belgium, 34%; Mexico, 24%; China, 21%; United Kingdom, 11%; and other, 10%.

<u>Tariff: Item</u>	<u>Number</u>	<u>Normal Trade Relations</u>
Bismuth and articles thereof, including waste and scrap	8106.00.0000	<u>12-31-04</u> Free.

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

Government Stockpile: None.

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Events, Trends, and Issues: Demand for bismuth will probably continue to grow during the current decade. Increasingly, bismuth is being used as a nontoxic replacement for lead in brass, pigments, and solders. Consumption of bismuth in the steel sector, although relatively minor compared with that of other use sectors, appears to be rising.

World lead mine and primary refinery production has remained essentially constant in recent years, limiting the amount of bismuth that can be produced as a lead byproduct. In China, the production of bismuth in 2004 dropped as compared with that of 2003. The drop was caused by closures of various metal mines and processing facilities in China that produce bismuth as a byproduct. Global lead and zinc mine output in 2005, however, is projected to increase significantly and could add to the bismuth supply. The dealer price increased through the first half of 2004; in July, however, the price started to decline. The average price for the first 10 months of 2004 was about 7% higher than that for the first 10 months of 2003.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves ²	Reserve base ²
	2003	2004 ^e		
United States	W	W	9,000	14,000
Bolivia	100	100	10,000	20,000
Canada	200	150	5,000	30,000
China	1,200	1,050	240,000	470,000
Kazakhstan	150	150	5,000	10,000
Mexico	1,000	1,000	10,000	20,000
Peru	1,000	1,000	11,000	42,000
Other countries	160	350	39,000	74,000
World total (rounded)	3,800	3,800	330,000	680,000

World Resources: Bismuth, at an estimated 8 parts per billion by weight, is the 69th element in order of abundance in the Earth's crust and is about twice as abundant as gold. World reserves of bismuth are usually based on bismuth content of lead resources because bismuth production is most often a byproduct of processing lead ores; in China, bismuth production is a byproduct of tungsten and other metal ore processing. Bismuth minerals rarely occur in sufficient quantities to be mined as principal products; the Tasna Mine in Bolivia and a mine in China are the only mines that produced bismuth from a bismuth ore. The Tasna Mine has been on standby status since the mid-1990s awaiting a significant rise in the metal price. Several bismuth-containing deposits are in varying stages of mining feasibility review. These polymetallic deposits include NICO in Canada, Nui Phao in Vietnam, and Bonfim in Brazil.

Substitutes: Bismuth can be replaced in pharmaceutical applications by alumina, antibiotics, and magnesia. Titanium dioxide-coated mica flakes and fish scale extracts are substitutes in pigment uses. Indium can replace bismuth in low-temperature solders. Resins can replace bismuth alloys for holding metal shapes during machining, and glycerine-filled glass bulbs can replace bismuth alloys in triggering devices for fire sprinklers. Free-machining alloys can be composed of lead, selenium, or tellurium as a replacement for bismuth.

Bismuth, on the other hand, is an environmentally friendly substitute for lead in plumbing and many other applications, including fishing weights, hunting ammunition, lubricating greases, and soldering alloys.

^eEstimated. W Withheld to avoid disclosing company proprietary data. — Zero.

¹Defined as imports – exports + adjustments for Government and industry stock changes.

²See [Appendix C](#) for definitions.