

BISMUTH

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

Domestic Production and Use: One refinery in Nebraska produced bismuth as a byproduct of lead refining, but bismuth operations ceased on June 30, 1997. There is no longer any domestic production of primary bismuth. Thirty-five companies in the Eastern United States accounted for an estimated three-fourths of the bismuth consumed in 1997. Based on the average annual price, the value of bismuth consumed was estimated at more than \$11.6 million. About 51% of bismuth was used in pharmaceuticals and chemicals, 30% in fusible alloys and solders, 16% in metallurgical additives, and 3% in other uses.

Salient Statistics—United States:	1993	1994	1995	1996	1997^e
Production, refinery	W	W	W	W	W
Imports for consumption	1,330	1,660	1,450	1,490	2,000
Exports ¹	70	160	261	151	200
Shipments from Government stockpile excesses	—	145	139	137	144
Consumption, reported	1,300	1,490	2,150	1,520	1,500
Price, average, domestic dealer, dollars per pound	2.50	3.25	3.85	3.65	3.50
Stocks, yearend, consumer	323	402	390	122	110
Employment, plant, number ^{e2}	30	30	30	30	30
Net import reliance ³ as a percent of apparent consumption	W	W	W	W	W

Recycling: Bismuth was recovered from fusible alloy scrap, contributing about 5% of the U.S. supply.

Import Sources (1993-96): Mexico, 34%; Belgium, 34%; China, 10%; the United Kingdom, 8%; and other, 14%.

Tariff: Item	Number	Most favored nation (MFN) 12/31/97	Non-MFN⁴ 12/31/97
Articles thereof, including waste and scrap	8106.00.0000	Free	7.5% ad val.

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

Government Stockpile:

Stockpile Status—9-30-97⁵

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 1997	Disposals FY 1997
Bismuth	85	2	85	136	144

Events, Trends, and Issues: On April 15, 1996, the only domestic producer announced that it had reached agreement with the City of Omaha, NE, to cease all operations at its Omaha refinery by February 1, 1998, and remediate the property for use as a park. The company stopped refining lead at Omaha on June 1, 1996, but had planned to continue processing other materials, including bismuth, at the plant until February 1998. However, bismuth production ceased on June 30, 1997.

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Bismuth was used in several applications designed to provide nontoxic substitutes for lead. Such products include bismuth fishing sinkers; bismuth shot for waterfowl hunting; and bismuth-containing brass, pigments, ceramic glazes, solders, lubricating greases, and crystal ware. To make a large impact on the bismuth market, lead would have to be banned or severely restricted nationwide for a significant demand use. In response to California court action, major faucet makers agreed in July 1995 to remove lead from plumbing fixtures. The Safe Drinking Water Act Amendments of 1996 will eventually require all pipes and fixtures for potable water to be lead-free. However, demand for bismuth in this sector had increased only slightly in 1997.

The use of bismuth in shot for waterfowl hunting increased significantly in 1997. The U.S. Fish and Wildlife Service granted final approval for the use of 97% bismuth-3% tin shot for waterfowl hunting. The shot is nontoxic to waterfowl who discover and ingest spent shot. It is an alternative to steel shot, which replaced lead shot for waterfowl hunting in 1991. Bismuth-tin shot has much better dropping power than steel shot.

World lead production has remained relatively unchanged in recent years, limiting the amount of bismuth that can be produced; world production of bismuth rose less than 1% in 1997. The domestic price fell from \$3.30 per pound to \$3.20 per pound during the first quarter, then rose to nearly \$4.00 per pound during the second quarter. The price drifted back down to \$3.50 per pound, the average price for the year. The price has decreased 2 years in a row.

The Defense Logistics Agency (DLA) sold 144 tons of bismuth from the National Defense Stockpile in fiscal year 1997. The DLA was authorized to dispose of the remaining inventory of 85 tons in fiscal year 1998, and had done so by November 1997.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves ⁶	Reserve base ⁶
	<u>1996</u>	<u>1997^e</u>		
United States	W	W	9,000	14,000
Australia	—	—	18,000	27,000
Bolivia	125	150	10,000	20,000
Canada	185	185	5,000	30,000
China	700	700	20,000	40,000
Japan	169	170	9,000	18,000
Kazakstan	155	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	<u>105</u>	<u>110</u>	<u>15,000</u>	<u>35,000</u>
World total (rounded)	<u>3,440</u>	<u>3,470</u>	110,000	260,000

World Resources: World reserves of bismuth are usually associated with lead deposits, except in China and North Korea, where bismuth is found with tungsten ores, and in Australia, where it is found with copper-gold ores. Bismuth minerals rarely occur in sufficient quantities to be mined as principal products, except in Bolivia and possibly in China. Bismuth is potentially recoverable as a byproduct of the processing of molybdenum and tungsten ores, although extraction of bismuth from these ores is usually not economic.

Substitutes: Antibiotics, magnesia, and alumina can replace bismuth in pharmaceutical applications. 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 jigs used for holding meal shapes during machining. Glycerine-filled glass bulbs replace bismuth alloys as a triggering device for fire sprinklers. Selenium, tellurium, or lead could replace bismuth in free machining alloys.

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

¹Includes bismuth, bismuth alloys, and waste and scrap.

²Data for first 6 months of 1997.

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

⁴See Appendix B.

⁵See Appendix C for definitions.

⁶See Appendix D for definitions.

⁷Excludes U.S. production.