

BISMUTH

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

Domestic Production and Use: One refinery in Nebraska formerly 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, mostly in the Eastern United States, accounted for an estimated three-fourths of the bismuth consumed in 1998. The value of bismuth consumed was estimated at more than \$14.3 million. About 48% of the bismuth was used in pharmaceuticals and chemicals, 33% in fusible alloys, solders, and cartridges, 17% in metallurgical additives, and 2% in other uses.

Salient Statistics—United States:	1994	1995	1996	1997	1998^e
Production, refinery	W	W	W	W	—
Imports for consumption, metal	1,660	1,450	1,490	2,170	2,700
Exports, metal, alloys, scrap	160	261	151	206	225
Shipments from Government stockpile excesses	145	139	137	229	—
Consumption, reported	1,490	2,150	1,520	1,530	1,800
Price, average, domestic dealer, dollars per pound	3.25	3.85	3.65	3.50	3.60
Stocks, yearend, consumer	402	390	122	213	150
Employment, refinery, number of workers ^{e 1}	30	30	30	30	—
Net import reliance ² as a percent of apparent consumption	W	W	W	W	100

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

Import Sources (1994-97): Belgium, 36%; Mexico, 32%; United Kingdom, 12%; China, 7%; and other, 13%.

Tariff: Item	Number	Normal Trade Relations (NTR) 12/31/98	Non-NTR³ 12/31/98
Articles thereof, including waste and scrap	8106.00.0000	Free	7.5% ad val.

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

Government Stockpile:

Material	Stockpile Status—9-30-98⁴				
	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 1998	Disposals FY 1998
Bismuth	—	—	—	85	85

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Events, Trends, and Issues: 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. 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 require that all new and repaired pipes and fixtures for potable water be lead-free after August 1998. Demand for bismuth in this sector increased moderately in 1998.

The use of bismuth in shot for waterfowl hunting increased significantly in 1998. The U.S. Fish and Wildlife Service granted final approval for the use of 97% bismuth-3% tin shot for waterfowl hunting in 1997. 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 mine production has increased moderately in recent years, but world primary lead refinery production has actually leveled off, limiting the amount of bismuth that can be produced. World mine and refinery production of bismuth rose moderately in 1998. The domestic price increased from \$3.33 per pound to \$4.08 per pound during the first quarter, then declined to \$3.65 per pound during the second quarter. The price continued to drift downward for the rest of the year, reaching \$3.40 per pound by the end of the third quarter. The average price for the year increased from \$3.50 to about \$3.60 per pound, following 2 years of decline.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves ⁵	Reserve base ⁵
	1997	1998 ^e		
United States	—	—	9,000	14,000
Australia	—	—	18,000	27,000
Bolivia	350	500	10,000	20,000
Canada	183	200	5,000	30,000
China	600	750	20,000	40,000
Japan	168	200	9,000	18,000
Kazakhstan	115	115	5,000	10,000
Mexico	1,640	1,650	10,000	20,000
Peru	1,000	1,000	11,000	42,000
Other countries	150	150	15,000	35,000
World total (rounded)	4,210	4,560	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 metal 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.

¹Data for first 6 months of 1997.

²Defined as imports - exports + adjustments for Government and industry stock changes.

³See Appendix B.

⁴See Appendix C for definitions.

⁵See Appendix D for definitions.