

BISMUTH

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

Domestic Production and Use: There is no domestic refinery production of primary bismuth. One refinery in Nebraska formerly produced bismuth as a byproduct of lead refining, but bismuth operations there ceased on June 30, 1997. Bismuth is contained in some domestically mined lead ores, but no byproduct bismuth was produced. Forty-four companies, mostly in the eastern United States, accounted for an estimated three-fourths of the bismuth consumed in 1999. The value of bismuth consumed was estimated at almost \$18 million. About 42% of the bismuth was used in pharmaceuticals and chemicals; 39% in fusible alloys, solders, and cartridges; 17% in metallurgical additives; and 2% in other uses.

Salient Statistics—United States:	1995	1996	1997	1998	1999^e
Production, refinery	W	W	W	—	—
Imports for consumption, metal	1,450	1,490	2,170	2,720	2,200
Exports, metal, alloys, scrap	261	151	206	245	220
Shipments from Government stockpile excesses	139	137	229	—	—
Consumption, reported	2,150	1,520	1,530	2,000	2,050
Price, average, domestic dealer, dollars per pound	3.85	3.65	3.50	3.60	3.85
Stocks, yearend, consumer	390	122	213	150	80
Employment, refinery, number of workers ^{e 1}	30	30	30	—	—
Net import reliance ² as a percent of apparent consumption	W	W	W	100	100

Recycling: Bismuth was recovered from fusible alloy scrap, but contributes less than 5% of the U.S. supply.

Import Sources (1995-98): Belgium, 34%; Mexico, 30%; United Kingdom, 16%; China, 10%; and other, 10%.

Tariff: Item	Number	Normal Trade Relations 12/31/99
Articles thereof, including waste and scrap	8106.00.0000	Free.

Depletion Allowance: 23% (Domestic), 15% (Foreign).

Government Stockpile: The final 85 tons of bismuth in the National Defense Stockpile was sold on November 4, 1997.

Stockpile Status—9-30-99³

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 1999	Disposals FY 1999
Bismuth	—	—	—	—	—

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Events, Trends, and Issues: Bismuth was used in several applications designed to provide nontoxic substitutes for lead. The Safe Drinking Water Act Amendment of 1996 required that all new and repaired fixtures and pipes for potable water be lead-free after August 1998. Other major areas of development included bismuth shot for waterfowl hunting, bismuth-containing solders, and lubricating greases, especially extreme pressure lubricants. A new area of development was the use of bismuth in galvanizing. Bismuth was also used in ceramic glazes, crystal ware, and pigments.

World lead mine production has increased moderately in recent years, but world primary lead refinery production has not increased—limiting the amount of bismuth that can be produced as a lead byproduct. Bismuth was also recovered from some copper ores and from tungsten ores, especially in Asia. World mine and refinery production of bismuth decreased in 1999. The domestic price increased from \$3.15 per pound to \$3.40 per pound during the first quarter, increased to \$3.75 per pound by the middle of the second quarter, and fell back to \$3.70 per pound by the start of the third quarter. The price increased to \$4.50 per pound during the third quarter and stabilized above \$4.00 per pound for the first time since 1995. The average price for the year increased for the second year in a row. It rose from \$3.60 to about \$3.85 per pound.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves ⁴	Reserve base ⁴
	1998	1999 ^e		
United States	—	—	9,000	14,000
Australia	—	—	18,000	27,000
Bolivia	650	650	10,000	20,000
Canada	180	180	5,000	30,000
China	600	700	20,000	40,000
Japan	150	150	9,000	18,000
Kazakhstan	115	115	5,000	10,000
Mexico	1,200	600	10,000	20,000
Peru	832	760	11,000	42,000
Other countries	150	150	15,000	35,000
World total (rounded)	3,880	3,310	110,000	260,000

World Resources: World reserves of bismuth are usually associated with lead deposits, except in China and North Korea, where economically recoverable 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 non-Asian tungsten ores, although extraction of bismuth from these ores usually is 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 alloy jigs used for holding metal shapes during machining. Glycerine-filled glass bulbs can replace bismuth alloys as a triggering device for fire sprinklers. Selenium, tellurium, and lead could replace bismuth in free-machining alloys.

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

¹Data for first 6 months of 1997, until shutdown of only domestic refiner.

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

³See Appendix B for definitions.

⁴See Appendix C for definitions.