

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 2000. The value of bismuth consumed was estimated at almost \$17 million. About 40% of the bismuth was used in pharmaceuticals and chemicals; 40% in fusible alloys, solders, and cartridges; 18% in metallurgical additives; and 2% in other uses.

Salient Statistics—United States:	1996	1997	1998	1999	2000^e
Production, refinery	W	W	—	—	—
Imports for consumption, metal	1,490	2,170	2,720	2,110	2,200
Exports, metal, alloys, scrap	151	206	245	257	300
Shipments from Government stockpile excesses	137	229	—	—	—
Consumption, reported	1,520	1,530	2,000	2,050	2,200
Price, average, domestic dealer, dollars per pound	3.65	3.50	3.60	3.85	3.50
Stocks, yearend, consumer	122	213	150	121	100
Employment, refinery, number of workers ¹	^e 30	^e 30	—	—	—
Net import reliance ² as a percent of apparent consumption	W	W	^e 95	^e 95	95

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

Import Sources (1996-99): Belgium, 33%; Mexico, 25%; United Kingdom, 18%; China, 15%; and other, 9%.

Tariff: Item	Number	Normal Trade Relations 12/31/00
Articles thereof, including waste and scrap	8106.00.0000	Free.

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

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

BISMUTH

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. Bismuth use in water meters was one particular application that increased. Other major areas of development included bismuth shot for waterfowl hunting, bismuth-containing solders, and lubricating greases, especially extreme pressure lubricants. The use of new zinc-bismuth alloys in galvanizing to achieve better processing continued to grow. Bismuth was also used in ceramic glazes, crystal ware, and pigments.

World lead mine production and world primary lead refinery production has not increased significantly in recent years, 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 increased in 2000. The domestic price decreased from \$4.30 per pound to \$3.93 per pound during the first quarter and decreased to \$3.53 per pound by the end of the second quarter. The price decreased to \$3.23 per pound during the third quarter, but it stabilized above \$3.00 per pound for the remainder of the year. The average price for the year decreased for the first time since 1997.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves ³	Reserve base ³
	1999	2000 ^e		
United States	—	—	9,000	14,000
Australia	—	—	18,000	27,000
Bolivia	255	300	10,000	20,000
Canada	311	300	5,000	30,000
China	400	500	20,000	40,000
Japan	135	150	9,000	18,000
Kazakhstan	130	130	5,000	10,000
Mexico	1,250	1,250	10,000	20,000
Peru	1,000	1,000	11,000	42,000
Other countries	139	150	15,000	35,000
World total (rounded)	3,620	3,780	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 C for definitions.