BISMUTH

(Data in metric tons unless otherwise specified)

Domestic Production and Use: The United States ceased production of primary refined bismuth in 1997 and is highly import reliant. Bismuth is contained in some lead ores mined domestically. However, the last domestic primary lead smelter closed at yearend 2013; since then, all lead concentrates have been exported for smelting.

Most domestic bismuth consumption was for chemicals used in cosmetic, industrial, laboratory, and pharmaceutical applications. Bismuth use in pharmaceuticals included bismuth subsalicylate (the active ingredient in over-the-counter stomach remedies) and other compounds used to treat burns, intestinal disorders, and stomach ulcers. Bismuth compounds such as bismuth nitrate, bismuth oxychloride, and bismuth vanadate are also used in industrial applications for the manufacture of ceramic glazes, crystalware, high-performance pigments, and pearlescent pigments.

Bismuth has a wide variety of metallurgical applications, including use as an additive to improve metal integrity of malleable cast iron in the foundry industry and as a nontoxic replacement for lead in brass, free-machining aluminum alloys and steels, and solders. The use of bismuth in brass for pipe fittings, fixtures, and water meters increased after 2014 when the definition of “lead-free” under the Safe Drinking Water Act was modified to reduce the maximum lead content of “lead-free” pipes and plumbing fixtures to 0.25% from 8%. The melting point of bismuth is relatively low at 271 degrees Celsius, and it is an important component of various fusible alloys. These bismuth-containing alloys can be used in holding devices for grinding optical lenses, as plugs for abandoned oil wells, as a temporary filler to prevent damage to tubes in bending operations, as a triggering mechanism for fire sprinklers, and in other applications in which a low melting point is ideal. Bismuth-tellurium-oxide alloy film paste is used in the manufacture of semiconductor devices.

Salient Statistics—United States:	**2019**	**2020**	**2021**	**2022**	**2023[e]**
Production:					
Refinery	—	—	—	—	—
Secondary (scrap)[e]	80	80	80	80	80
Imports for consumption, metal, alloys, and scrap:					
Containing more than 99.99% bismuth, by weight	NA	NA	NA	754	540
Other	NA	NA	NA	2,340	1,300
Total[1]	2,340	1,650	1,980	3,090	1,800
Exports, metal, alloys, and scrap:					
Containing more than 99.99% bismuth, by weight	NA	NA	NA	144	180
Other	NA	NA	NA	359	340
Total[2]	636	699	1,010	502	520
Consumption:					
Apparent[3]	1,690	1,210	1,030	2,610	1,400
Reported	548	513	597	724	NA
Price, average,[4] dollars per pound	3.18	2.72	3.74	3.90	4.10
Stocks, yearend, consumer, bismuth metal	443	271	297	356	340
Net import reliance[5] as a percentage of apparent consumption	95	93	92	97	94

Recycling: Recycled bismuth-containing alloy scrap was thought to compose 3% to 8% of U.S. bismuth apparent consumption for the years 2019–23.

Import Sources (2019–22): China,[6] 68%; Republic of Korea, 20%; Belgium, 2%; Mexico, 2%; and other, 8%.

Tariff: **Item**	**Number**	**Normal Trade Relations 12–31–23**
Bismuth and articles thereof, including waste and scrap:		
Containing more than 99.99% of bismuth, by weight	8106.10.0000	Free.
Other	8106.90.0000	Free.

Depletion Allowance: 22% (domestic), 14% (foreign).

Government Stockpile: None.

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BISMUTH

Events, Trends, and Issues: The estimated annual average price for bismuth (in-warehouse, Rotterdam) in 2023 was $4.10 per pound, a 5% increase from that in 2022 and the highest annual average price since 2018. Bismuth metal prices in China, the leading producer and exporter of bismuth, reached a 5-year high in September reportedly owing to high feedstock prices as competition for bismuth ore increased among domestic smelters, despite lower exports. Bismuth metal exports from China (Harmonized System code 8106) through August 2023 were 2,510 tons, about 40% less than exports during the same periods in 2021 and 2022. In March 2023, the Liyang Zhonglianjin E-commerce commodity exchange platform began trading 99.99% bismuth.

Estimated world production of bismuth was essentially the same in 2023 as in 2022; reported bismuth production data were unavailable for most countries.

World Refinery Production and Reserves:

	Refinery production[e]		Reserves[7]
	2022	2023	
United States	—	—	Quantitative estimates of reserves were not available.
Bolivia	—	40	
Bulgaria	50	50	
China	15,500	16,000	
Japan	490	500	
Kazakhstan	190	160	
Korea, Republic of	810	850	
Laos	[8]1,940	2,000	
World total (rounded)	19,000	20,000	

World Resources:[7] Bismuth reserves data were generally not reported at a mine or country level and thus difficult to quantify. Bismuth minerals rarely occur in sufficient quantities to be mined as principal products; bismuth is produced most often as a byproduct during the processing of lead ores. In China and Vietnam, bismuth is also produced as a byproduct or coproduct of tungsten and other metal ore processing. In Japan and the Republic of Korea, bismuth is produced as a byproduct or coproduct of zinc ore processing. The Tasna Mine in Bolivia, which has been inactive since 1996, and a mine in China are the only mines where bismuth has been the primary product.

Substitutes: Bismuth compounds can be replaced in pharmaceutical applications by alumina, antibiotics, calcium carbonate, and magnesia. Titanium-dioxide-coated mica flakes and fish-scale extracts are substitutes in certain pigment uses. Cadmium, indium, lead, and tin can partially replace bismuth in low-temperature solders. Resins can replace bismuth alloys for holding metal shapes during machining, and glycerin-filled glass bulbs can replace bismuth alloys in triggering devices for fire sprinklers. Free-machining alloys can contain lead, selenium, or tellurium as a replacement for bismuth. Bismuth is an environmentally friendly substitute for lead in plumbing and many other applications, including fishing weights, hunting ammunition, lubricating greases, and soldering alloys.

[e]Estimated. NA Not available. — Zero.

[1]Includes data for the following Harmonized Tariff Schedule of the United States codes: 8106.00.0000 (2019–21), and 8106.10.0000 and 8106.90.0000 (2022–23).

[2]Includes data for the following Schedule B numbers: 8106.00.0000 (2019–21), and 8106.10.0000 and 8106.90.0000 (2022–23).

[3]Defined as secondary production + imports – exports ± adjustments for industry stock changes.

[4]Prices are based on 99.99%-purity metal at warehouse (Rotterdam) in minimum lots of 1 ton. Source: Fastmarkets.

[5]Defined as imports – exports ± adjustments for industry stock changes.

[6]Includes Hong Kong.

[7]See Appendix C for resource and reserve definitions and information concerning data sources.

[8]Reported.