

BISMUTH

(Data in metric tons gross weight unless otherwise noted)

Domestic Production and Use: The United States ceased production of primary refined bismuth in 1997 and is highly import dependent for its supply. 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. In 2018, the estimated value of apparent consumption of bismuth was approximately \$25 million.

About two-thirds of domestic bismuth consumption was for chemicals used in cosmetic, industrial, laboratory, and pharmaceutical applications. Bismuth use in pharmaceuticals included bismuth salicylate (the active ingredient in over-the-counter stomach remedies) and other compounds used to treat burns, intestinal disorders, and stomach ulcers. Bismuth is also used in the manufacture of ceramic glazes, crystalware, and pearlescent pigments.

Bismuth has a wide variety of metallurgical applications, including use as an additive to enhance metallurgical quality in the foundry industry and as a nontoxic replacement for lead in brass, free-machining steels, and solders. The Safe Drinking Water Act Amendment of 1996, which required that all new and repaired fixtures and pipes for potable water supply be lead free after August 1998, opened a wider market for bismuth as a metallurgical additive to lead-free pipe fittings, fixtures, and water meters. Bismuth is used as a triggering mechanism for fire sprinklers and in holding devices for grinding optical lenses. Bismuth-tellurium-oxide alloy film paste is used in the manufacture of semiconductor devices.

Salient Statistics—United States:	2014	2015	2016	2017	2018^e
Production:					
Refinery	—	—	—	—	—
Secondary (scrap) ^e	80	80	80	80	80
Imports for consumption, metal, alloys, and scrap	2,270	1,950	2,190	2,820	2,800
Exports, metal, alloys, and scrap	567	519	431	392	580
Consumption:					
Apparent ¹	1,750	1,490	1,780	2,530	2,300
Reported	655	621	710	756	680
Price, average, domestic dealer, dollars per pound ²	11.14	6.43	4.53	4.93	4.90
Stocks, yearend, consumer	430	456	512	487	510
Net import reliance ³ as a percentage of apparent consumption	95	95	96	97	96

Recycling: Bismuth-containing alloy scrap was recycled and thought to compose less than 5% of U.S. bismuth apparent consumption, or about 110 tons.

Import Sources (2014–17): China, 80%; Belgium, 8%; Mexico, 4%; Republic of Korea, 2%; and other, 6%.

Tariff: Item	Number	Normal Trade Relations 12–31–18
Bismuth and articles thereof, including waste and scrap	8106.00.0000	Free.

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

Government Stockpile: None.

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Events, Trends, and Issues: The U.S. domestic dealer average price of bismuth started 2018 at \$5.25 per pound, increased slightly to a high of \$5.30 per pound in March and April, and generally decreased throughout the remainder of the year. Bismuth reached a low of \$4.15 per pound in late August and early September before it increased to \$4.30 per pound in mid-September.

New environmental policies that came into effect in 2018 in China resulted in many bismuth smelters shutting down temporarily for inspections or permanently for infractions. However, smelters still in operation increased their output to offset the loss of production from the closures. Global bismuth prices decreased throughout most of 2018.

In May 2018, the U.S. Department of the Interior, in coordination with other executive branch agencies, published a list of 35 critical minerals (83 FR 23295), including bismuth. This list was developed to serve as an initial focus, pursuant to Executive Order 13817, "A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals" (82 FR 60835).

World Refinery Production and Reserves: Available information was inadequate to make reliable estimates for mine production and reserves data.

	Refinery production		Reserves ⁴
	2017	2018 ^e	
United States	—	—	Quantitative estimates of reserves are not available.
Bulgaria	50	50	
Canada	25	25	
China	13,500	13,000	
Japan	525	590	
Kazakhstan	270	270	
Laos	2,000	2,000	
Mexico	513	340	
World total (rounded)	16,900	16,000	

World Resources: Bismuth ranks 65th in elemental abundance in the Earth's continental crust, at an estimated 85 parts per billion by weight, constituting much less than 0.001%. World reserves of bismuth are usually estimated based on the bismuth content of lead resources because bismuth production is most often a byproduct of processing lead ores. In China and Vietnam, bismuth production is a byproduct or coproduct of tungsten and other metal ore processing. Bismuth minerals rarely occur in sufficient quantities to be mined as principal products; the Tasna Mine in Bolivia and a mine in China are the only mines where bismuth has been the primary product. The Tasna Mine in Bolivia has been inactive since 1996.

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 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 glycerine-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.

^eEstimated. — Zero.

¹Defined as secondary production + imports – exports + adjustments for industry stock changes.

²Source: American Metal Market.

³Defined as imports – exports + adjustments for industry stock changes.

⁴See Appendix C for resource and reserve definitions and information concerning data sources.