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2014 Minerals Yearbook

BISMUTH [ADVANCE RELEASE]

U.S. Department of the Interior
U.S. Geological Survey

June 2016

Bismuth

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In 2014, reported bismuth consumption in the United States was 727 metric tons (t), 6% less than that in 2013 (tables 1, 2). However, the estimated value of bismuth consumed domestically was $18 million in 2014, 20% higher than in 2013.

Bismuth was last produced domestically as a byproduct of lead refining at a Nebraska refinery that closed in 1997. The last stocks of bismuth in the National Defense Stockpile were sold that same year. In 2014, all primary bismuth consumed in the United States was imported, primarily from China. The other principal suppliers to the United States were, in descending order by weight, Belgium, Bolivia, Peru, and Chile. A small amount of bismuth was obtained by recycling old scrap.

Production

Although domestic production of primary refined bismuth ceased in 1997, some domestic firms continued to remelt bismuth alloy scrap. Secondary production was estimated to be less than 5% of domestic supply during 2014.

Consumption

The U.S. Geological Survey surveyed domestic bismuth consumers on a quarterly and annual basis. Thirty-five companies were surveyed for bismuth consumption, and 15 responded, accounting for about 50% of U.S. consumption. The amount of bismuth consumed by nonrespondents to the survey was estimated based on prior reports or on information from other sources.

The largest use of bismuth in the United States is in chemicals. Within chemicals, the leading use of bismuth is pharmaceuticals, including bismuth salicylate (the active ingredient in over-the-counter stomach remedies) and other bismuth medicinal compounds used to treat burns, intestinal disorders, and stomach ulcers in humans and animals. Bismuth nitrate is the initial chemical used for the production of most bismuth pharmaceutical compounds. Other applications of bismuth chemicals and compounds include superconductors and pearlescent pigments for cosmetics and paints.

Bismuth metal is used primarily as a major constituent of various alloys and as a metallurgical additive (table 2). One class of bismuth-base alloys, fusible alloys (low melting point, as low as 20 °C), consists of combinations of bismuth with other metals, such as antimony, cadmium, gallium, indium, lead, and tin. Applications for those alloys include fuel tank safety plugs, holders for optical lenses and other articles for machining or grinding, solders, and fire sprinkler triggering mechanisms. Bismuth is also added in small amounts to aluminum and copper alloys to improve machinability and to malleable iron to prevent formation of graphite flakes.

Bismuth substitutes for lead in certain steel products to provide greater machinability, and in lead-free glasses, pigments, shot for water fowl hunting, and solder. Although bismuth has been used successfully to replace lead in various applications, tin and tungsten compete with bismuth as a substitute for lead in some applications.

Prices

In 2014, the average Platts Metals Week New York dealer price for bismuth increased to $11.14 per pound, an increase of 29% from the low price in 2013. The weekly average bismuth price range began 2014 at $9.00 to $9.60 per pound and increased during the year to $11.50 to $11.90 per pound at yearend. The price peaked in September, with a range of $12.10 to $13.00 per pound for the month (fig. 1). Bismuth prices increased in September owing to continued investment activity on China's Fanya Metal Exchange Co. Ltd. The Fanya Metal Exchange reported that, by yearend 2013, inventories of bismuth metal in Fanya warehouses had risen to 5,100 t and, by December 2014, Fanya inventories had reached 18,600 t, or approximately a year of global refined bismuth production. The yearend decrease in bismuth prices was attributed to manufacturers selling inventory. Even with the rise in Fanya inventories, Chinese exports of unwrought bismuth increased by 50% to 6,082 t in 2014 (Chao, 2015a, b, c).

Foreign Trade

U.S. exports of bismuth alloys, metal, and waste and scrap were 567 t, a decrease of 31% from that in 2013 (table 3). U.S. imports of bismuth metal were 2,270 t, an increase of 33% compared with that in 2013. The leading supplier of U.S. imports was China (72%), followed by Belgium (14%) and Bolivia (4%) (table 4). China reported shipping 578 t of bismuth to the United States, and the U.S. Census Bureau indicated U.S. receipts of 1,670 t of bismuth (Chao, 2015c). This discrepancy may reflect transit time and shipment of material through Belgium. China reported exporting 3,960 t of bismuth to Belgium.

World Review

Bismuth was produced principally as a byproduct of the smelting of lead ores. In China, however, it was also a byproduct of fluorspar, tin, and tungsten ore processing.

World refinery production of bismuth was estimated to be 17,000 t, essentially unchanged from that in 2013 (table 5). China was the world's leading producer of refined bismuth, accounting for 90% of the estimated world total, followed by Mexico with 6%.

Canada.—Fortune Minerals Ltd. (London, Ontario) was granted final approval for a Type A water license for the NICO gold-cobalt-bismuth-copper mine in the Northwest Territories. The water license was one of the final steps in the permitting process, allowing construction to begin once financing had been received. Output was expected to be 40,500 troy ounces per year of gold, 1,600 metric tons per year (t/yr) of cobalt, 1,700 t/yr of bismuth, and 250 t/yr of copper (Evans, 2014a; Fortune Minerals Ltd., 2014).

China.—Bismuth prices began the year at the highest level in 2 years. Major producers reportedly stockpiled the metal to boost prices and profits throughout the year, but when the price declined in the fourth quarter, producers reportedly sold their stocks aggressively. Initial price rises were attributed to the increasing Fanya Metal Exchange stockpile of bismuth, but when stock accumulation temporarily halted at the end of the third quarter at about 15,000 t, prices began to decrease (Chao, 2014a, b, c, d, e).

Peru.—The sale of the former Doe Run Peru La Oroya smelter complex, a former producer of bismuth and other byproduct metals, and the Cobriza copper mine continued to be delayed. In July, the smelter closed as a cost-saving measure. Although the sale of the complex had been expected to take place in 2014, the sale was deferred into 2015 after the Government took longer than anticipated to approve environmental guidelines for reopening and remediating the smelter complex. According to the facility administration firm, Right Business S.A., the smelter complex would require an $800 million cleanup and modernization investment (Evans, 2014b, c, d).

Vietnam.—Masan Resources Corp. began producing bismuth in 2014 at their Nui Phao polymetallic mine. Nui Phao also has significant amounts of tungsten and some flurspar and copper. In 2014, Masan Resources produced 4,945 t of bismuth concentrate (Masan Resources Corp., 2015).

Outlook

Most of the end uses of bisumth, especially its use as a metallurgical additive, are in the industrial sectors of the economy. An increase in demand will likely depend on economic growth in emerging nations and bismuth being used as a replacement for lead. The accumulation of stocks of bismuth on China's Fanya Metal Exchange continued throughout 2014, indicating that global supplies were more than adequate to meet demand. In the medium term, global mine and refinery production are expected to increase with facility improvements to older mine producers of bismuth, and a new mine is expected to open in Canada.

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TABLE 1
SALIENT BISMUTH STATISTICS[1]

		2010	2011	2012	2013	2014
United States:						
Consumption[e]	metric tons	636	696	647	774	727
Exports[2]	do.	1,040	628	764	816	567
Imports for consumption of metallic bismuth	do.	1,620	1,750	1,700	1,710	2,270
Price, average, domestic dealer	dollars per pound	8.76	11.47	10.10	8.71	11.14
Stocks, December 31, consumer	metric tons	133	138	134	50	329
World production:[3]						
Mine, metal content	do.	7,700	8,100	7,100 [r]	8,400	8,600
Refinery	do.	16,000	17,000	16,000 [r]	17,000	17,000

[e]Estimated. [r]Revised. do. Ditto.
[1]Data are rounded to no more than three significant digits, except prices.
[2]Comprises bismuth metal and the bismuth content of alloys and waste and scrap.
[3]Data are rounded to no more than two significant digits.

TABLE 2
ESTIMATED BISMUTH METAL CONSUMED
IN THE UNITED STATES, BY USE[1]

(Kilograms)

Use	2013	2014
Chemicals[2]	549,000	499,000
Bismuth alloys	62,400	66,000
Metallurgical additives	W	W
Other	W	W
Total	774,000	727,000

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes industrial and laboratory chemicals, cosmetics, and pharmaceuticals.

TABLE 3
U.S. EXPORTS OF BISMUTH METAL, ALLOYS, AND WASTE AND SCRAP, BY COUNTRY[1]

	2013		2014	
Country	Quantity (kilograms, metal content)	Value (thousands)	Quantity (kilograms, metal content)	Value (thousands)
Belgium	--	--	3,410	$85
Brazil	7,200	$83	5,560	64
Canada	136,000	1,270	109,000	1,070
Chile	--	--	4,010	120
China	33,700	309	84,000	914
Costa Rica	6,100	63	1,200	16
Ecuador	--	--	1,760	30
French Guiana	4,790	44	--	--
Germany	76,000	1,530	--	--
Hong Kong	51,800	487	43,600	393
Israel	1,390	19	150	25
Japan	1,300	28	362	3
Korea, Republic of	37	8	3,540	67
Malaysia	11,000	100	9,240	84
Mexico	37,300	578	81,600	1,160
Netherlands	20,200	383	8,950	196
Peru	82	13	4,300	51
Russia	--	--	1,210	11
Singapore	4,880	68	2,970	41
South Africa	1,360	18	50	6
Taiwan	1,310	19	1,710	16
Thailand	26,500	241	4,820	49
United Kingdom	12,200	247	4,700	89
Vietnam	382,000	3,470	188,000	1,710
Other (15 countries)[2]	1,570	52 [r]	2,960	96
Total	816,000	9,040	567,000	6,300

[r]Revised. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes countries with a quantity less than 1,000 kilograms in 2013 and 2014.

Source: U.S. Census Bureau.

TABLE 4
U.S. IMPORTS FOR CONSUMPTION OF METALLIC BISMUTH, BY COUNTRY[1]

	2013		2014	
Country	Quantity (kilograms)	Value (thousands)	Quantity (kilograms)	Value (thousands)
Belgium	389,000	$7,430	303,000	$7,370
Bolivia	--	--	80,200	1,850
Canada	13,000	719	19,000	465
Chile	--	--	40,000	909
China	1,050,000	20,300	1,670,000	38,100
Germany	24,400	451	1,980	110
India	--	--	444	35
Indonesia	50	5	69	20
Korea, Republic of	35,000	629	35,000	682
Malaysia	3,700	383	7,380	676
Netherlands	170	39	338	103
Peru	144,000	2,540	71,600	1,380
United Kingdom	43,300	1,090	38,200	991
Total	1,710,000	33,600	2,270,000	52,700

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 5
BISMUTH: WORLD MINE AND REFINERY PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

	Mine[3]					Refinery				
Country[4]	2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
Bolivia	87	41	10 e	10 e	10 e	--	31	--	--	--
Bulgaria	3 r, 5	-- r, 5	1 r, 5	3 r	-- 5	3 r, 6	-- r	1 r	--	--
Canada	91	92	121	35	3	150	150	145	100	100
China	6,500	7,000	6,000 r	7,500	7,600	14,000	15,000	14,000 r	15,500	15,300
Italy[e]	--	--	--	--	--	5	5	5	5	5
Japan[7]	--	--	--	--	--	454	460 e	470 e	480 r, e	480 e
Kazakhstan	--	--	--	--	--	150	150	150	150	150
Mexico[5, 6]	952	935	940 r	824	948	952	935	940 r	824	948
Russia	50	50	40	40	40	10	10	8	8	8
Total[8]	7,700	8,100	7,100 r	8,400	8,600	16,000	17,000	16,000 r	17,000	17,000

eEstimated. rRevised. -- Zero.

[1]Estimated data are rounded to no more than three significant digits.

[2]Includes data available through September 29, 2015. Bismuth is produced as a byproduct of mining and processing other metals, mainly lead and tungsten. Not all mines that produce ores containing recoverable bismuth report their production. Therefore, some bismuth production may only be accounted for at the refinery level.

[3]Metal content.

[4]In addition to the countries listed, Belgium and Romania produced refined bismuth and Vietnam mined bismuth, but available information is inadequate to make reliable estimates of output levels.

[5]Mine production not reported and assumed to be equal to refinery production.

[6]Refinery production estimated from reported exports.

[7]Refined bismuth was produced as a byproduct of zinc production.

[8]World totals are rounded to no more than two significant digits.

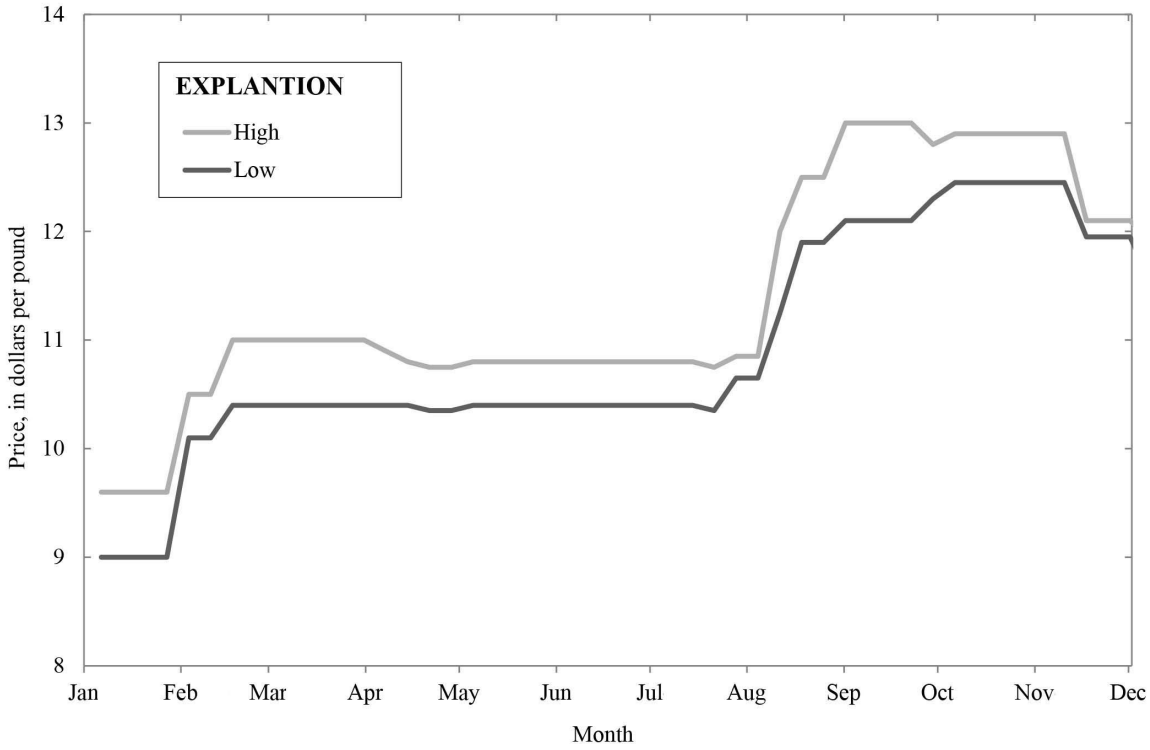

Figure 1. Monthly average bismuth price range for 2014. Source: Platts Metals Week.