



2016 Minerals Yearbook

ANTIMONY [ADVANCE RELEASE]

ANTIMONY

By Kateryna Klochko

Domestic survey data and tables were prepared by Hoa P. Phamdang, statistical assistant.

In 2016, no marketable antimony was mined in the United States. A mine in Nevada that had extracted about 800 metric tons (t) of stibnite ore from 2013 through 2014 was placed on care-and-maintenance status in 2015 and had no reported production in 2016. Primary antimony metal and antimony trioxide were produced by one company in Montana by upgrading imported antimony intermediate products. Secondary antimony was recovered as a component of lead alloys from recycled lead-acid batteries at secondary lead smelters.

Reported consumption of primary antimony increased by 10% from that in 2015 primarily owing to increases in consumption for use in metal products (table 2). In 2016, about 31% of the reported primary antimony used in the United States was in flame retardants; most of the remaining antimony was used in ceramics, glass, and lead-base alloys (table 3). Secondary antimony, which was derived almost entirely from antimonial lead contained in recycled lead-acid batteries, was used in the manufacture of new batteries. The worldwide end-use distribution of antimony in 2014 (latest year for which data were available) was reported to be flame retardants, 50%; lead-acid batteries, 35%; heat stabilizers and plastics, 7%; and other uses, 8% (Roskill Information Services Ltd., 2015, p. 111).

Antimony was commercially mined as a principal product or was recovered as a byproduct during the smelting of base metal ores in nine countries. China was the world's leading producer of primary antimony, accounting for 75% of world mine production, followed by Tajikistan (10%) and Russia (6%) (table 9). Estimated global mine production increased slightly from that in 2015.

Production

Mine.—In October 2013, First Liberty Power Corp. (FLPC) (Las Vegas, NV) began mining stibnite (antimony trisulfide) ore for upgrade and sale at its Fencemaker antimony project, 194 kilometers northeast of Reno, NV. By February 2014, more than 750 t of raw stibnite ore had been produced and was being stored at a nearby facility for further processing. In 2014, the company reported that it had been working to acquire additional permits to construct a concentrator and refinery. However, the company experienced financial challenges during 2014, and the mine was placed on care-and-maintenance status in early 2015 (Roskill Information Services Ltd., 2015, p. 241). The company did not provide any updates on the project in 2016.

In September, Midas Gold Corp. (Canada) began a drilling program at its Stibnite Gold project in the Stibnite-Yellow Pine mining district in Idaho to update the mineral reserves and resources at the project before commencing a feasibility study. The company also took steps to initiate the environmental assessment and permitting process (Midas Gold Corp., 2016).

Smelter.—The United States had only one antimony smelter, operated by U.S. Antimony Corp. (USAC) (Thompson Falls, MT) in Montana. The smelter processed intermediate antimony products from Australia, Canada, and Mexico; recovered precious metals; and produced antimony trioxide and metal. The company also operated a smelter and mines in Mexico. USAC produced antimony metal for bearings, lead alloys, and ordnance; antimony oxide as a raw material for flame retardants; and sodium antimonite for glass and other applications. USAC also recycled antimony-containing products that would otherwise be discarded. In 2015, USAC concluded a capacity expansion project at its smelter in Madero, Mexico, with the addition of a large furnace and five smaller furnaces to process high-grade concentrates. As a result of these additions, the company's antimony production increased. In 2016, USAC reported selling about 1,332 t antimony as contained metal (645 t produced in the United States, 687 t in Mexico) compared with 1,128 t (627 t produced in the United States, 501 t in Mexico) in 2015, an increase of 18% (U.S. Antimony Corp., 2017, p. 21).

Consumption

Of the 107 companies to which a U.S. Geological Survey (USGS) antimony consumption survey was sent, 81 firms responded. Consumption data were estimated for the remaining 26 firms. Reported consumption of primary antimony increased by 10% from that in 2015, primarily owing to an increase in consumption for use in metal products (table 3). The reported consumption of primary antimony in the United States in 2016 was divided between three main groups of products: metal products (lead-antimony alloys), 38.7%; nonmetal products, 30.5%; and flame retardants (antimony trioxide), 30.8%. Lead-antimony alloys were used in the production of lead-acid batteries, ammunition, antifriction bearings, cable sheaths, corrosion-resistant pumps and pipes, roof sheet solder, and tank linings. Antimony oxide was used primarily in conjunction with a halogen to form a flame-retardant system for coatings, fiberglass, paper, plastics, rubber, textile goods, and paints. Antimony oxide was also used as a color fastener in paint, as a catalyst for production of polyester resins for fibers and film, as a catalyst for production of polyethylene terephthalate in plastic bottles, and as a phosphorescent agent in fluorescent light bulbs.

Prices

In 2016, the average Platts Metals Week New York dealer price of antimony was \$3.35 per pound, an increase of 3% compared with that in 2015 (table 1). The price for antimony started to recover in March 2016 after a 23% decline in the average annual price in 2015 (the lowest average annual price since 2010) and continued to increase during 2016.

Foreign Trade

U.S. imports for consumption of antimony in 2016 were, as has been the case in the recent past, much more than exports (tables 5–8). Imports for consumption of antimony oxide (metal content) in 2016 were 16,200 t, a 3% decrease from that in 2015. Imports for consumption of antimony metal, alloys, and waste and scrap in 2016 were 7,130 t, a 23% increase from that in 2015. China was the leading supplier to the United States, accounting for 62% of antimony metal imports and 70% of antimony oxide (metal content) imports in 2016 (tables 7–8). Exports of antimony oxide (metal content) in 2016 were 1,330 t, a 24% decrease from that in 2015. Exports of antimony metal, alloys, and waste and scrap (gross weight) were 623 t, a decrease of 57% from that in 2015; Mexico was the leading destination, accounting for 36%.

World Review

In 2016, global mine production of antimony increased slightly to 144,000 t from 143,000 t in 2015. China (75%), Tajikistan (10%), and Russia (6%) were the leading global producers of antimony in 2016. Global mine production was about 25% less than it was in 2013 (the historical peak for global antimony mine production) owing primarily to declines in production in Burma, Canada, China, South Africa, and Turkey (table 9).

Globally, consumption of primary and secondary antimony was estimated to be about 188,000 t in 2016, a slight increase from that in 2015, owing primarily to increased consumption for use in heat stabilizers for plastics, flame retardants, and lead-acid batteries. Asia accounted for more than 50% of global antimony consumption (Roskill Information Services Ltd., 2015, p. 192).

Australia.—Mandalay Resources Corp. (Canada) operated the Costerfield gold-antimony mine in Victoria. Mandalay purchased the idled mine in 2009 and restarted operations in 2010. In 2016, the mine produced 3,573 t of antimony in concentrate, a 4% decrease from 3,712 t produced in 2015 (Mandalay Resources Corp., 2017).

China.—In 2016, China continued to be the dominant producer of mined antimony, accounting for about 75% of global mine production (table 9). The largest and highest grade deposits were in southern China, specifically, in Guangxi Zhuang Autonomous Region and Hunan and Yunnan Provinces. China was also the leading global producer of antimony metal and oxides, leading importer of antimony contained in ore and concentrates, and leading exporter of antimony metal and oxide. Antimony mine production was reported to be about 108,000 t in 2016, a 3% decrease from that in 2015 and about 30% less than that produced in 2013 (table 9). Hsikwangshan Twinkling Star Co., Ltd. (one of the leading antimony mine and metal producers in China) and eight smaller producers in Hunan Province were required by the Government to consolidate and reduce antimony metal production capacity in 2016. The eight smaller producers were required to reduce their combined metal production capacity to about 25,000 metric tons per year (t/yr) from 48,000 t/yr, and Hsikwangshan Twinkling Star was

required to reduce production capacity to 18,000 t/yr from 28,000 t/yr (Xu, 2016a, b).

In October 2016, China's State Reserve Bureau (SRB) purchased 8,000 t of antimony metal to add to the growing national stockpile, which in turn may have led to price increases. China's antimony producers increased production in the last quarter of 2016 in response to the price increases and stockpile purchases. This contrasted with the first quarter of 2016, when producers cut back production. China's output of antimony metal and oxide (antimony content) was 15,200 t in October 2016, 3% more than that in October 2015. However, production during the first 10 months of 2016 was 168,900 t, 3% less than that of the same period in 2015 (Metal-Pages, 2016b).

In 2016, China's Ministry of Finance and Commerce excluded antimony from a list of industrial products that would be subject to export quotas in 2017, suggesting that the export quotas for antimony may be cancelled. The removal of export quotas could potentially increase exports of antimony in 2017. In 2016, the export quota for antimony was 54,400 t, 8% less than that in 2015 (Metal-Pages, 2016a).

Oman.—Strategic & Precious Metals Processing LLC [a joint venture between Oman Investment Fund (40%), Tri-Star Resources Plc (40%), and DNR Industries (40%)] continued development of the Oman Antimony Roaster Project in Sohar. The facility was expected to produce 26,000 t of antimony and about 1,560 kilograms of gold annually. Operations were projected to commence in 2017, with commercial production beginning in the first quarter of 2018 (Tri-Star Resources Plc, 2017, p. 5).

Tajikistan.—Antimony was mined from the Dzhydzhikrutskoe antimony-mercury deposit in the Sughd Province, owned by the U.S.-based company Comsup Commodities Inc. (Chorshanbiyev, 2011). The deposit was estimated to produce up to 700,000 t of antimony ore. Anzob Mining and Processing Co. operated the Dzhydzhikrutskoe underground mine and produced antimony-mercury concentrates via flotation. In 2016, mine production of antimony was estimated to be about 14,000 t (table 9). Most of the antimony-mercury concentrates were exported to China for smelting (Roskill Information Services Ltd., 2015, p. 87; Tajik Development Gateway, undated).

Outlook

Global consumption of antimony is expected to increase from 2015 to 2020 owing to projected increases in use for flame retardants, lead-acid batteries, and plastics, primarily in Asia. Asia is expected to continue to be the leading consuming region, accounting for about 60% of global consumption by 2020 (Roskill Information Services Ltd., 2015, p. 192).

Globally, flame retardants are expected to remain the principal use of antimony. The increase in antimony prices from 2009 to 2011 led some producers of flame retardants to switch to less expensive substitutes where possible. However, if prices continue to decline, substitution for antimony could reverse as antimony is still a preferred synergist in many flame-retardant applications.

Antimony recovered from scrap has been an important part of the total domestic antimony supply. Recovery, however, is limited to the quantity contained in end-of-life batteries. Since 2001, a typical automotive lead-acid battery has contained a maximum of 0.6% antimony.

In recent years, lead-acid battery manufacturers have initiated research and development programs that could ultimately lead to significant changes in lead-acid battery design. This research has already yielded performance improvements that could make lead-acid batteries viable options for future generation hybrid vehicles. These batteries might use less lead per battery than conventional lead-acid batteries and could reduce or eliminate the use of antimony in lead-acid battery alloys. Consumption of antimony for batteries in North America has declined over the past few decades as many newer starting, lighting, and ignition battery designs, such as sealed “maintenance-free” batteries, are manufactured with alloys of lead with calcium, selenium, or tin instead of antimony owing to performance and price advantages. Lead-antimony alloys are still expected to be used in deep cycle batteries for motive power in boats, forklifts, golf carts, and some standby batteries.

Although production has declined in China and its antimony reserves may be declining, numerous antimony prospects around the world are being explored and developed, and future supplies of antimony are expected to be sufficient to meet demand. Mine projects in Australia, Bolivia, Canada, Kyrgyzstan, and Turkey are in various stages of development and could potentially become new sources of supply (Roskill Information Services Ltd., 2015, p. 192–193, 198).

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GENERAL SOURCES OF INFORMATION

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TABLE 1
SALIENT ANTIMONY STATISTICS¹

(Metric tons, antimony content unless otherwise specified)

	2012	2013	2014	2015	2016
United States:					
Smelter production:					
Primary	W	W	W	W	W
Secondary	3,050	4,410	4,230	3,850	3,780
Exports:					
Ore and concentrates ²	106	35	41	30	12
Metal, alloys, waste and scrap ²	847	1,550	1,570	1,440	623
Antimony oxide ³	3,830	2,410 ^r	1,670	1,760	1,330
Imports for consumption:					
Ore and concentrates	380	342	378	308	119
Metal, alloys, waste and scrap ²	5,050	6,170	6,210	5,790	7,130
Antimony oxide ³	17,200	18,200	17,600	16,700	16,200
Reported industrial consumption, primary antimony	8,050	9,040	8,520	8,270	9,070
Stocks, primary antimony, all classes, December 31	1,430	1,470	1,400	1,290 ^r	1,090
Price, average ⁴	5.65	4.63	4.25	3.27	3.35
World, mine production	174,000 ^r	193,000 ^r	157,000 ^r	143,000 ^r	144,000

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

¹Table includes data available through May 30, 2018. Data are rounded to no more than three significant digits, except prices.

²Gross weight.

³Antimony content data were calculated by the U.S. Geological Survey.

⁴New York dealer price, in dollars per pound, for 99.65% metal, cost, insurance, freight U.S. ports. Source: Platts Metals Week.

TABLE 2
REPORTED INDUSTRIAL CONSUMPTION OF
PRIMARY ANTIMONY IN THE UNITED STATES¹

(Metric tons, antimony content)

Class of material consumed	2015	2016
Metal	950	1,780
Oxide	5,860	5,550
Other ²	1,460	1,740
Total	8,270	9,070

¹Table includes data available through May 30, 2018.

Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes residues and sulfide.

TABLE 3
REPORTED INDUSTRIAL CONSUMPTION OF PRIMARY ANTIMONY IN THE
UNITED STATES, BY PRODUCT¹

(Metric tons, antimony content)

Product	2015	2016
Metal products:		
Antimonial lead	W	W
Bearing metal and bearings	20	9
Solder	19	15
Other ²	2,410	3,480
Total	2,450	3,510
Nonmetal products:		
Ammunition primers	W	W
Ceramics and glass	W	W
Pigments	808	765
Plastics	42 ^r	35
Other ³	2,110	1,970
Total	2,960	2,770
Flame retardants:		
Adhesives	59	127
Plastics	2,200	2,290
Pigments	--	2
Rubber	153	18
Textiles	450	360
Total	2,860	2,790
Grand total	8,270	9,070

^rRevised. W Withheld to avoid disclosing company proprietary data. -- Zero.

¹Table includes data available through May 30, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes ammunition, cable covering, castings, sheet and pipe, and type metal.

³Includes fireworks and rubber products.

TABLE 4
INDUSTRY STOCKS OF PRIMARY ANTIMONY IN
THE UNITED STATES, DECEMBER 31¹

(Metric tons, antimony content)

Type of material	2015	2016
Metal	198	314
Oxide	751 ^r	717
Other ²	340	57
Total	1,290 ^r	1,090

^rRevised.

¹Table includes data available through May 30, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes ore and concentrate, residues, and sulfide.

TABLE 5
 U.S. EXPORTS OF ANTIMONY METAL, ALLOYS, AND WASTE AND SCRAP,
 BY COUNTRY OR LOCALITY¹

Country or locality	2015		2016	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Australia	6	\$27	6	\$44
Austria	16	69	11	97
Belgium	18	79	14	104
Brazil	--	--	6	19
Canada	32	133	86	308
Chile	--	--	4	18
China	125	479	24	75
Czechia	--	--	5	18
Denmark	--	--	6	35
Dominican Republic	18	86	10	43
Georgia	--	--	2	5
Germany	169	538	78	497
Greece	20	127	--	--
Guatemala	6	35	4	54
India	36	136	3	11
Italy	3	9	6	49
Japan	40	250	1	4
Korea, Republic of	448	1,730	13	39
Mexico	208	946	223	976
Netherlands	10	32	8	38
Peru	--	--	23	127
Poland	45	140	26	79
South Africa	37	156	--	--
Swaziland	10	45	5	79
Sweden	4	18	10	42
Taiwan	55	172	10	31
Turkey	6	17	--	--
United Arab Emirates	2	5	--	--
United Kingdom	103	319	16	127
Venezuela	14	158	20	146
Other	2 ^r	34 ^r	3	29
Total	1,430	5,740	623	3,090

^rRevised. -- Zero.

¹Table includes data available through May 30, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 6
U.S. EXPORTS OF ANTIMONY OXIDE, BY COUNTRY OR LOCALITY¹

Country or locality	2015			2016		
	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)
Argentina	1	1	\$8	3	2	\$8
Australia	54	45	239	64	53	212
Belgium	3	2	23	26	22	115
Brazil	--	--	--	118	98	276
Canada	28	24 ^r	194	68	56	408
Chile	7	6	48	7	6	46
China	114	94	508	20	17	82
Colombia	175	145	1,370	157	130	1,060
Costa Rica	197	163	2,120	62	51	400
France	114	95	596	106	88	327
Germany	242	201	814	113	94	367
Hong Kong	102	85	271	(3)	(3)	6
India	(3)	(3)	5	2	2	10
Indonesia	64	53	439	4	4	23
Israel	--	--	--	36	30	333
Italy	18	15	105	14	11	95
Japan	361	300	1,890	316	262	1,630
Korea, Republic of	22	18	57	95	79	579
Malaysia	--	--	--	17	14	45
Mexico	176	146	1,470	94	78	569
Singapore	29	24	104	66	55	218
South Africa	5	4	13	12	10	33
Switzerland	--	--	--	1	1	7
Taiwan	258	214	1,140	104	87	302
Thailand	2	2	6	--	--	--
United Arab Emirates	60	50	188	--	--	--
United Kingdom	82	68	376	61	51	314
Venezuela	--	--	--	32	26	227
Other	(3) ^r	(3) ^r	9 ^r	--	--	--
Total	2,120	1,760	12,000	1,600	1,330	7,690

^rRevised. -- Zero.

¹Table includes data available through May 30, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

²Antimony content data were calculated by the U.S. Geological Survey.

³Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 7
U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY, BY CLASS AND COUNTRY OR LOCALITY¹

Country or locality	2015			2016		
	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)
Antimony ore and concentrates:						
Austria	4	2	\$24	--	--	--
Bosnia and Herzegovina	--	--	--	9	3	\$16
Canada	(3)	(3)	5	--	--	--
China	53	39	297	--	--	--
India	--	--	--	(3)	(3)	5
Italy	388	254	2,670	160	113	998
Japan	5	3	63	(3)	(3)	4
Mexico	22	11	268	5	2	7
Total	473	308	3,330	174	119	1,030
Antimony oxide:						
Belgium	2,000	1,660	15,100	2,110	1,750	12,500
Bolivia	1,980	1,640	12,500	1,090	904	5,650
Brazil	18	15	151	1	1	8
Chile	80	66	391	--	--	--
China	10,800	8,960	59,000	13,500	11,200	58,800
France	344	286	2,950	333	277	2,200
Hong Kong	(3)	(3)	3	--	--	--
India	11	9	94	6	5	39
Japan	578	480	3,460	677	562	3,760
Korea, Republic of	3	3	16	34	28	177
Liechtenstein	--	--	--	(3)	(3)	2
Mexico	1,040	862	9,480	654	543	5,970
Netherlands	--	--	--	10	9	54
Spain	36	30	138	--	--	--
Thailand	3,200	2,660	7,740	1,020	847	3,240
United Kingdom	(3)	(3)	19	2	2	29
Total	20,100	16,700	111,000	19,500	16,200	92,400

-- Zero.

¹Table includes data available through May 30, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

²Antimony ore and concentrates content reported by the U.S. Census Bureau. Antimony content of oxide data were calculated by the U.S. Geological Survey.

³Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 8
U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY METAL, ALLOYS,
AND WASTE AND SCRAP, BY COUNTRY OR LOCALITY¹

Country or locality	2015		2016	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Austria	(2)	\$12	--	--
Bolivia	31	240	52	\$350
Brazil	(2)	2	1	9
Canada	(2)	126	2	262
China	3,050	23,100	4,390	26,800
France	(2)	82	--	--
Germany	(2)	145	1	263
Hong Kong	40	334	20	96
India	1,420	10,800	901	5,350
Japan	176	584	(2)	1,570
Korea, Republic of	--	--	156	876
Mexico	382	2,900	582	4,330
Tajikistan	20	160	20	128
Thailand	80	624	40	274
United Kingdom	354	3,690	387	3,870
Vietnam	243	1,580	579	3,250
Total	5,790	44,400	7,130	47,500

-- Zero.

¹Table includes data available through May 30, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

²Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 9
ANTIMONY: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY¹

(Metric tons, antimony content)

Country or locality	2012	2013	2014	2015	2016
Australia ²	2,481	3,275	3,639 ^r	3,712 ^r	3,573
Bolivia	5,081	5,052	4,186	3,843 ^r	2,669
Burma ³	5,900	7,200	3,300	3,000	3,000
Canada ²	100 ^{r,e}	177 ^r	5 ^e	1 ^e	--
China	136,000 ^e	152,000 ^{r,e}	123,000 ^{r,e}	111,000 ^{r,e}	107,525
Guatemala	62	67	159	50 ^e	25
Iran	--	400 ^e	432 ^{r,e}	216 ^{r,e}	200 ^e
Kazakhstan, concentrate	865	--	481	500	573
Laos	521	804	620	650	242
Mexico	169	294	270 ^e	--	196
Pakistan	12	89	127	121	114 ^e
Russia ^e	7,300	8,700	8,000 ^r	8,000 ^r	8,000
South Africa, concentrate ²	3,066	2,405	815	400 ^e	1,200 ^e
Tajikistan, ore	5,545 ^r	7,307 ^r	8,058 ^r	8,000 ^e	14,000 ^e
Turkey, concentrate ^e	6,590 ^r	4,180 ^r	3,070 ^r	1,950 ^r	1,950
Vietnam	480 ^r	990 ^r	1,100 ^r	1,344 ^r	643
Total	174,000 ^r	193,000 ^r	157,000 ^r	143,000 ^r	144,000

^eEstimated. ^rRevised. -- Zero.

¹Table includes data available through November 13, 2017. All data are reported unless otherwise noted. Totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Antimony content of antimony ore and concentrate, lead concentrates, and lead-zinc concentrates.

³Data estimated on the basis of reported imports of antimony ores and concentrates from Burma by China, India, Singapore, and Thailand.