



2021 Minerals Yearbook

ANTIMONY [ADVANCE RELEASE]

ANTIMONY

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In 2021, no marketable antimony was mined in the United States. Primary antimony metal production consisted only of residual antimony from primary antimony consumption and no other production data were reported in 2021. Secondary antimony production increased by 15% to 4,050 metric tons (t) and was recovered almost entirely as a component of lead alloys from recycled lead-acid batteries at secondary lead smelters (table 1). Secondary antimony was used in the manufacture of new batteries.

Reported industrial domestic consumption of primary antimony was 6,240 t in 2021, a 14% increase from the reported consumption in 2020. In 2021, apparent consumption of antimony was 28,200 t, 25% more than that in 2020 (table 1).

Antimony was mined commercially as a principal product or was recovered as a byproduct during the smelting of base-metal ores in 16 countries in 2021. China, the world's leading producer of antimony, accounted for an estimated 46% of world mine production, followed by Tajikistan (20%) and Russia (14%). Estimated global mine production decreased by 27% to 82,600 t in 2021 compared with the revised production in 2020 (table 8).

Production

Mine.—In 2021, no marketable antimony was mined in the United States. In December 2020, Midas Gold Corp. announced completion of a feasibility study for its Stibnite Gold Project in Idaho. Highlights of the feasibility study published by the company showed potential total recoverable antimony of 34,500 t in the first 4 years of operation, and 53,500 t during the mine life of 15 years (Midas Gold Corp., 2020). In January 2021, Midas Gold announced that U.S. Federal agencies—the Environmental Protection Agency, and U.S. Department of Agriculture, Forest Service, with concurrence by the U.S. Department of Justice—had directed the company to perform immediate cleanup of contaminated legacy conditions within Idaho's abandoned Stibnite mining district. Midas Gold also announced that it would move its headquarters from Vancouver, British Columbia, Canada, to Boise, ID (Midas Gold Corp., 2021). In February 2021, the company announced a name change from Midas Gold to Perpetua Resources Corp. (Perpetua Resources Corp., 2021a). In May 2021, Perpetua Resources Corp. announced that it had signed a collaboration agreement with U.S. Antimony Corp. (USAC) to study the potential for processing the Stibnite Gold Project's antimony concentrate at USAC's processing facilities (Perpetua Resources Corp., 2021c). In August 2021, Perpetua Resources Corp. announced that the company had entered into an agreement to supply a portion of antimony production from the Stibnite Gold Project to Ambri Inc., which had developed an antimony-based, liquid metal battery for the stationary, long-duration, daily cycling energy storage market (Perpetua Resources Corp., 2021b).

Primary Smelter.—The United States had only one primary antimony smelter, operated by USAC in Montana. The smelter processed intermediate antimony products from Canada and Mexico, recovered precious metals, and produced antimony trioxide and metal. The company also operated a smelter and mines in Mexico. The company's smelters produced antimony metal for bearings, lead-acid batteries, and ordnance; antimony oxide as a raw material primarily for flame retardants; and sodium antimonite primarily for glass in cathode ray tubes and other applications. In 2021, USAC reported selling about 413 t of antimony from United States and Mexico production combined, a 12% increase compared with 370 t sold in 2020 (U.S. Antimony Corp., 2022, p. 17). Antimony metal production in the United States was not reported and included only 19 t of residual antimony from primary antimony consumption in 2021.

Secondary Antimony.—Antimony recovered from scrap is 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. All secondary antimony in the United States was produced at secondary lead smelters from scrap battery grids and other battery parts, and from bearing metal, type metal, and other antimonial lead scrap. Domestic production data were compiled from a U.S. Geological Survey (USGS) canvass of these facilities. In 2021, 14 secondary lead smelters were surveyed. Of the 14 smelters, 12 responded—3 smelters reported antimony production, and 9 smelters reported no antimony production. Production from the two nonrespondent smelters was estimated based on previous years' responses. Approximately 4,050 t of secondary antimony was recovered, a 15% increase from that in 2020 (table 1).

Consumption

Of the 134 companies to which a USGS antimony consumption survey was sent, 102 companies responded. Consumption data were estimated for the remaining 32 companies. Reported consumption of primary antimony was 6,240 t, a 14% increase from that in 2020 (tables 1, 2). The reported consumption of primary antimony in the United States in 2021 was used in three main groups of products: metal products (lead-antimony alloys), 44%; flame retardants (antimony trioxide), 35%; and nonmetal products, 21% (table 3). Lead-antimony alloys were used primarily in the production of lead-acid batteries, and for ammunition, antifriction bearings, cable sheaths, corrosion-resistant pumps and pipes, roof sheet solder, and tank linings. Antimony oxide was used primarily in conjunction with halogen to form flame-retardant systems, and for coatings, fiberglass, paints, paper, plastics, rubber, and textile goods. Antimony oxide also was used as a catalyst for production of polyester resins for fibers and film, as a catalyst

for production of polyethylene terephthalate in plastic bottles, as a color fastener in paint, and as a phosphorescent agent in fluorescent light bulbs.

In 2021, domestic apparent antimony consumption was 28,200 t, 25% more than that in 2020 (table 1). Worldwide, the leading antimony consumers were China (40%), Europe (19%), and North America (17%) (Project Blue, 2023, p. 6).

Prices

In 2021, the average price of antimony was \$5.31 per pound (minimum 99.65% antimony, cost, insurance, and freight), almost double that in 2020 (table 1). Because China dominated world antimony supply, its antimony market influenced antimony prices. In 2021, the effects on shipping issues from the global coronavirus disease 2019 (COVID-19) pandemic largely affected China's antimony ore supply chain from Burma. In addition, a primary supplier of antimony to China, the Olimpiada Mine in Russia, significantly reduced antimony production, which led to a deficit of feedstock at China's refineries and caused the price to increase (Project Blue, 2023, p. 20).

Foreign Trade

Domestic imports for consumption of antimony in 2021 far exceeded exports, which had been the case in recent years. Imports for consumption of antimony oxide (antimony content) in 2021 were 19,100 t, an increase of 28% from those in 2020 (table 1). The leading suppliers of antimony oxide to the United States were China (75%) and Belgium (12%) (table 6). Imports for consumption of unwrought antimony (gross weight) in 2021 were 7,480 t, an increase of 36% from those in 2020 (table 1). The leading suppliers of unwrought antimony to the United States were India (28%), and China (23%) (table 7). Exports of antimony oxide (antimony content) in 2021 were 1,530 t, an increase of 25% from those in 2020 (table 1). Japan (45%), China (12%), and Brazil (11%) were the leading destinations (table 5). Exports of unwrought antimony (gross weight) were 921 t, an increase of 134% from those in 2020; Mexico and Canada were the leading destinations, accounting for 45% and 38% of unwrought antimony shipments, respectively (table 4).

World Review

In 2021, global mine production of antimony decreased by 27% to 82,600 t from 114,000 t (revised) in 2020 (tables 1, 8). Most of the decrease in production was due to production decreases of 22,900 t in China and 9,500 t in Russia. China (46%), Tajikistan (20%), and Russia (14%) were estimated to be the leading global producers of mined antimony. Globally, consumption of primary and secondary antimony was estimated to be about 180,000 t in 2021, a 3% increase from that in 2020 (Project Blue, 2023, p. 10).

Australia.—Mandalay Resources Corp. (Canada) operated the Costerfield gold-antimony mine in the State of Victoria. In 2021, the mine produced 3,380 t of salable antimony, a 13% decrease from 3,900 t in 2020. The Youle deposit continued to be the

primary source of ore in 2021 (Mandalay Resources Corp., 2021, p. 16; 2022, p. 16).

China.—In 2021, China continued to be the leading producer of mined antimony, accounting for an estimated 46% of global mine production (table 8). Antimony mine production was estimated to be 38,100 t in 2021, a 38% decrease from that in 2020 (table 8). Mine production had been decreasing for the past decade owing to lower grade ores and declining reserves. China had been supplementing its dwindling domestic ore supply by importing feedstock from Burma, Russia, and Tajikistan for processing. In the aftermath of the COVID-19 pandemic, the supply chains from these countries have been affected. In addition, Russia's Olimpiada Mine focused on gold mine production and limited antimony production in 2021 (Project Blue, 2023, p. 2). China was still 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 oxides.

Russia.—PJSC Polyus' Olimpiada Mine was one the world's largest antimony mines, in terms of production, and began to sell its antimony flotation concentrates in 2018. Olimpiada's antimony production capacity was estimated to be 23,000 metric tons per year (Project Blue, 2023, p. 20). However, the company focused largely on gold production and had not ramped up production of antimony ores as expected. In 2021, the mine produced only 2,500 t of antimony in flotation concentrate, compared with 11,000 t of antimony in flotation concentrate in 2020 (PJSC Polyus, 2021, p. 21).

Outlook

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 yielded performance improvements that may make lead-acid batteries viable options for future generations of 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.

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TABLE 1
SALIENT ANTIMONY STATISTICS¹

(Metric tons, antimony content, unless otherwise specified)

		2017	2018	2019	2020	2021
United States:						
Smelter production:						
Primary ²		621	331	377	254	19
Secondary		4,370	4,090	4,140	3,520 ^r	4,050
Exports:						
Ore and concentrates	gross weight	46	38	9	10	9
Unwrought antimony ³	do.	643	497	370	393	921
Antimony oxide ⁴		1,600	1,750	1,570	1,230	1,530
Waste and scrap	gross weight	11	9	14	11	136
Imports for consumption:						
Ore and concentrates		61	96	121	105	31
Unwrought antimony ⁵	gross weight	6,810	6,320	6,670	5,520	7,480
Antimony oxide ⁴		17,800	19,200	17,200 ^r	15,000	19,100
Waste and scrap	gross weight	16	202	17	6	13
Apparent consumption of antimony ⁶		27,400	27,700	26,500	22,600 ^r	28,200
Reported industrial consumption, primary antimony		6,550	6,260	5,810	5,500	6,240
Price, average ⁷	dollars per metric ton	8,318	8,410	6,695	5,895	11,701
Price, average ⁷	dollars per pound	3.98	3.88	3.90	2.67	5.31
World, mine production ⁸		141,000	155,000 ^r	134,000 ^r	114,000 ^r	82,600

^rRevised. do. Ditto.

¹Table includes data available through November 17, 2022. Data are rounded to no more than three significant digits, except prices.

²Contains residual antimony from primary antimony consumption. Domestic antimony produced at the primary antimony facility was not reported in 2021. Source: U.S. Antimony Corp., 2022, Form 10-K—2021: U.S. Securities and Exchange Commission: Thompson Falls, MT, U.S. Antimony Corp. (Accessed August 21, 2023, via https://www.sec.gov/ix?doc=/Archives/edgar/data/0000101538/000165495422004348/uamy_10k.htm).

³Includes unwrought antimony powders and antimony articles.

⁴Antimony content data were calculated by the U.S. Geological Survey using an average of 83% antimony content of “crude” antimony trioxide and finished antimony trioxide senarmontite.

⁵Includes unwrought antimony powders and antimony articles.

⁶Defined as primary and secondary antimony smelter production plus imports of unwrought antimony and antimony oxides minus exports of unwrought antimony and antimony oxides.

⁷Minimum 99.65% antimony cost, insurance, freight U.S. ports. Source: Argus Metals International.

⁸May include estimated data.

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

(Metric tons, antimony content)

Class of material consumed	2020	2021
Metal	1,330 ^r	2,100
Oxide	3,430	3,380
Other ²	735 ^r	763
Total	5,500	6,240

^rRevised.

¹Table includes data available through September 6, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes residues and sulfide; excludes rubber products.

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

(Metric tons, antimony content)

Product	2020	2021
Metal products:		
Antimonic lead	W	W
Bearing metal and bearings	7	7
Solder	19	19
Other ²	1,970	2,710
Total	1,990	2,740
Nonmetal products:		
Ammunition primers	W	W
Ceramics and glass	189	204
Pigments	W	W
Plastics	317	589
Other ³	783	496
Total	1,290	1,290
Flame retardants:		
Adhesives	33	34
Pigments	--	--
Plastics	1,740	1,700
Rubber	85	103
Textiles	354	381
Total	2,220	2,220
Grand total	5,500	6,240

W Withheld to avoid disclosing company proprietary data; not included in totals. -- Zero.

¹Table includes data available through September 6, 2022. 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 ammunition primers, pigments and miscellaneous products; excludes rubber products.

TABLE 4
U.S. EXPORTS OF ANTIMONY METAL, ALLOYS, AND WASTE AND SCRAP,
BY COUNTRY OR LOCALITY¹

Country or locality	2020		2021	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
<u>Unwrought antimony:²</u>				
Australia	1	\$7	(3)	\$4
Brazil	7	23	28	88
Canada	97	443	347	1,070
Cayman Islands	--	--	(3)	13
Chile	3	8	--	--
China	53	272	(3)	3
Czechia	10	31	2	5
France	3	187	2	13
Georgia	--	--	1	3
Germany	5	20	9	26
Hong Kong	7	21	9	29
India	--	--	1	8
Israel	3	10	5	16
Italy	3	10	12	38
Japan	14	92	8	42
Kazakhstan	2	21	--	--
Korea, Republic of	1 ^r	4	(3)	4
Malaysia	3	10	12	38
Mexico	130	1,060	411	2,390
Panama	1	26	5	73
Peru	--	--	14	44
Philippines	8	25	2	11
Poland	--	--	2	106
Qatar	--	--	2	7
Saudi Arabia	2	44	3	8
Singapore	2	47	--	--
Spain	10	32	8	25
Sweden	4	17	(3)	7
Switzerland	5	15	16	51
Taiwan	15	46	11	35
Thailand	1	4	--	--
United Kingdom	--	--	2	20
Venezuela	2	22	5	94
Vietnam	--	--	1	5
Total	393	2,500	921	4,280
<u>Waste and scrap:⁴</u>				
Canada	--	--	79	533
Chile	11	45	11	48
Mexico	--	--	45	95
Total	11	45	136	676

^rRevised. -- Zero.

¹Table includes data available through August 2, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

²Schedule B codes 8110.10.0000 (unwrought antimony powders) and 8110.90.0000 (antimony articles).

³Less than ½ unit.

⁴Schedule B code 8110.20.0000. Includes antimony waste and scrap.

Source: U.S. Census Bureau.

TABLE 5
U.S. EXPORTS OF ANTIMONY OXIDE, BY COUNTRY OR LOCALITY¹

Country or locality	2020			2021		
	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)
Australia	27	22	\$135	2	2	\$16
Belgium	21	17	95	80	67	300
Brazil	83	68	354	205	170	846
Canada	119	98	489	35	29	167
Chile	18	15	97	6	5	55
China	299	248	1,620	220	182	621
Colombia	48	40	263	39	32	309
Denmark	--	--	--	(3)	(3)	4
France	48	40	152	42	35	164
Germany	20	17	118	11	9	120
Guatemala	4	4	11	--	--	--
India	2	1	12	--	--	--
Indonesia	17	14	99	39	32	308
Italy	22	18	156	26	21	215
Japan	274	228	1,490	827	686	4,370
Korea, Republic of	6	5	16	7	6	18
Malaysia	17	14	59	--	--	--
Mexico	234	194	1,300	89	74	623
Netherlands	42	35	156	70	58	234
Poland	(3)	(3)	6	--	--	--
Russia	--	--	--	27	22	69
Saudi Arabia	14	11	66	26	21	91
Singapore	44	37	138	13	10	42
South Africa	--	--	--	6	5	26
Taiwan	13	11	33	--	--	--
Thailand	7	6	27	--	--	--
Trinidad and Tobago	28	23	92	--	--	--
Turkey	68	56	384	68	57	424
United Kingdom	1	1	16	3	2	22
Total	1,480	1,230	7,380	1,840	1,530	9,050

-- Zero.

¹Table includes data available through August 2, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

²Schedule B codes 2825.80.0000 (antimony oxides). Antimony content data were calculated by the U.S. Geological Survey using an average of 83% antimony content of "crude" antimony trioxide and finished antimony trioxide senarmontite.

³Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 6
U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY, BY CLASS AND COUNTRY OR LOCALITY^{1,2}

Country or locality	2020			2021		
	Gross weight (metric tons)	Antimony content (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content (metric tons)	Value (thousands)
Antimony ore and concentrate:						
Belgium	11	11	\$79	5	5	\$72
Bosnia and Herzegovina	5	4	28	--	--	--
China	53	38	286	--	--	--
India	17	16	113	(3)	(3)	8
Italy	35	31	211	26	24	187
Mexico	3	3	17	2	1	14
Total	125	105	735	33	31	282
Antimony oxide:						
Belgium	1,830	1,520	11,100	2,650	2,200	24,900
Bolivia	986	818	4,680	951	789	7,540
Canada	98	82	515	45	37	470
China	14,200	11,800	62,700	17,300	14,400	115,000
France	267	222	1,610	825	684	8,130
India	5	4	30	15	12	134
Japan	443	368	2,090	202	167	945
Korea, Republic of	55	46	235	144	119	740
Mexico	171	142	641	60	50	226
Sweden	--	--	--	(3)	(3)	3
Thailand	--	--	--	781	648	1,990
United Kingdom	2	1	22	(3)	(3)	3
Total	18,000	15,000	83,600	23,000	19,100	160,000

-- Zero.

¹Table includes data available through August 2, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

²Harmonized Tariff Schedule of the United States (HTS) code 2617.10.0000 (antimony ore and concentrate) and 2825.80.0000 (antimony oxides). Antimony content data were calculated by the U.S. Geological Survey using an average of 83% antimony content of "crude" antimony trioxide and finished antimony trioxide senarmontite.

³Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 7
U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY METAL, ALLOYS,
AND WASTE AND SCRAP, BY COUNTRY OR LOCALITY¹

Country or locality	2020		2021	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
<u>Unwrought antimony:²</u>				
Australia	1	\$74	1	\$14
Bolivia	70	369	80	706
Burma	1,690	9,300	457	3,090
Canada	1	93	1	305
Cayman Islands	(3)	34	--	--
Chile	20 ^r	92	--	--
China	991	6,100	1,740	16,600
Dominican Republic	1	33	1	45
France	1	10	4	80
Germany	(3)	30 ^r	1	71
Hong Kong	125	675	--	--
India	1,560	8,650	2,100	18,300
Indonesia	--	--	26	234
Japan	37	1,280	197	1,450
Korea, Republic of	2	15	--	--
Mexico	36	475	123	1,440
Oman	280	1,520	424	3,930
Peru	--	--	12	120
Tajikistan	--	--	55	438
Thailand	39	222	1,040	9,760
Turkey	4	23	--	--
United Kingdom	253	2,920	248	4,300
Vietnam	404	2,240	974	8,670
Total	5,520	34,100	7,480	69,500
<u>Waste and scrap:⁴</u>				
China	(3)	9	--	--
Germany	--	--	(3)	29
Hungary	2	19	--	--
Mexico	4	3	12	18
Total	6	31	13	48

^rRevised. -- Zero.

¹Table includes data available through August 2, 2022. Data are rounded to no more than three significant digits; may not add to totals shown.

²Harmonized Tariff Schedule of the United States (HTS) codes 8110.10.0000 (unwrought antimony powders) and 8110.90.0000 (antimony articles).

³Less than 1/2 unit.

⁴HTS code 8110.20.0000. Includes antimony waste and scrap.

Source: U.S. Census Bureau.

TABLE 8
ANTIMONY: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY¹

(Metric tons, antimony content, unless otherwise)

Country or locality	2017	2018	2019	2020	2021
Australia ²	3,115	2,173	2,032	3,903	3,380
Bolivia	2,881	3,110	2,747 ^r	2,629 ^r	3,084
Burma ^{e,3}	3,060	2,640	4,800 ^r	1,300 ^r	4,600
Canada ²	1	5	5	2	2 ^e
China	97,700	95,300	79,900 ^r	61,000	38,000 ^e
Ecuador	68 ^e	9 ^e	1 ^e	--	--
Guatemala ^e	--	--	100	80	80
Honduras	3 ^e	12 ^e	--	--	--
Iran ^e	600	600	400	400	500
Kazakhstan ^e	300	100	500	100	650
Kyrgyzstan	750 ^e	676 ^r	16 ^r	--	40
Laos	320	370	140	--	240
Mexico ^e	1,300	800	800	700	700
Pakistan	15	--	--	17	66
Russia	14,400	32,000 ^{r, e}	24,000 ^{r, e}	21,000 ^{r, e}	12,000 ^e
Tajikistan	14,000 ^e	15,240	16,000 ^r	21,000 ^r	16,777
Turkey	2,500 ^e	1,800 ^{r, e}	2,000 ^{r, e}	1,458 ^r	2,567
Vietnam ^{e,4}	230	240	400	310 ^r	310
Total	141,000	155,000 ^r	134,000 ^r	114,000 ^r	82,600

^eEstimated. ^rRevised. -- Zero.

¹Table includes data available through July 11, 2023. All data are reported unless otherwise noted; totals may include estimated data. 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 concentrate, and lead-zinc concentrate.

³Data estimated from United Nations Comtrade database for antimony ores and concentrates imported from Burma by China, India, Singapore, and Thailand.

⁴Figures were converted to antimony content (using a conversion factor of 40% antimony) from gross weight in metric tons, which was reported as follows: 2017—575; 2018—600; 2019—1,000; 2020—775; and 2021—775.