



2022 Minerals Yearbook

ANTIMONY [ADVANCE RELEASE]

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ANTIMONY

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In 2022, no marketable antimony was mined in the United States. Primary antimony metal was produced at a facility in Montana, but production has not been reported publicly since 2021. Secondary antimony production was 4,100 metric tons (t) and was recovered almost entirely as a component of lead alloys from recycled lead-acid batteries at secondary lead smelters. Secondary antimony was used in the manufacture of new batteries. Reported domestic industrial consumption of primary antimony was 6,770 t in 2022, a 4% increase from the revised reported consumption in 2021. Apparent consumption of antimony was 25,100 t, 11% less than that in 2021 (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 2022. China, the world's leading producer of antimony, accounted for an estimated 48% of world mine production, followed by Tajikistan (25%), Turkey (7%), Burma (6%), and Russia (5%). Estimated global mine production was 83,100 t in 2022 compared with 82,600 t in 2021 (table 8).

Production

Mine.—In 2022, no marketable antimony was mined in the United States. In December 2020, Midas Gold Corp. announced completion of the feasibility study for the Perpetua Stibnite Gold project in Idaho. Results of the feasibility study suggested potential total recoverable antimony of 34,500 t in the first 4 years of operation and 53,500 t during a mine life of 15 years (Midas Gold Corp., 2020). In February 2021, the company announced a name change from Midas Gold Corp. to Perpetua Resources Corp. (Perpetua Resources Corp., 2021). In June 2022, Perpetua Resources Corp. announced that the company awarded the contract for cleanup in the historical Stibnite mining district to IMCO Construction. This phase of cleanup would begin with improving water quality at the abandoned Stibnite mining district, which had been degraded by elevated levels of arsenic and antimony from unconstrained tailings and other mine waste left by the previous operators over the past 100 years (Perpetua Resources Corp., 2022b). Also in June 2022, Perpetua received its first permit for the Stibnite Gold project, the Clean Air Act Permit to Construct from the Idaho Department of Environmental Quality (Perpetua Resources Corp., 2022d). In September 2022, Perpetua was awarded \$200,000 in grants from the U.S. Department of Defense, Defense Logistics Agency, to study domestic production of military grade antimony trisulfide used in the production of ammunition and other defense materials (Perpetua Resources Corp., 2022a). In December 2022, Perpetua was awarded a \$24.8 million Technology Investment Agreement under title III of the Defense Production Act by the Air Force Research Laboratory to complete environmental and engineering studies for a Final Environmental Impact Statement,

a Final Record of Decision, and other permits necessary to begin domestic production of antimony trisulfide (Perpetua Resources Corp., 2022c).

Primary Smelter.—The United States had only one primary antimony smelter in 2022, operated by the U.S. Antimony Corp. (USAC) in Montana. The smelter processed intermediate antimony products from Canada and Mexico, recovered precious metals, and produced antimony trioxide and metal. The company 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 2022, USAC reported selling a combined 632 t of antimony from its operations in the United States and Mexico, a 53% increase compared with 413 t sold in 2021 (U.S. Antimony Corp., 2023, p. 60). Antimony metal production in the United States was not reported in 2022.

Secondary Antimony.—Antimony recovered from scrap was an important part of the total domestic antimony supply. Recovery, however, was limited to the quantity contained in end-of-life batteries. Since 2001, a typical automotive lead-acid battery contained a maximum of 0.6% antimony. All of the 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 2022, 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 other two smelters was estimated based on previous years' responses. Approximately 4,100 t of secondary antimony was recovered in 2022 (table 1).

Consumption

Of the 94 companies to which a USGS antimony consumption survey was sent, 66 companies responded. Consumption data were estimated for the remaining 28 companies. Reported consumption of primary antimony was 6,770 t, a 4% increase from that in 2021 (tables 1, 2). The reported consumption of primary antimony in the United States in 2022 was used in three main groups of products: metal products (lead-antimony alloys), 43%; flame retardants (antimony trioxide), 36%; and nonmetal products, 22% (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 a 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 2022, domestic apparent antimony consumption was 25,100 t, 11% less than that in 2021 (table 1). Worldwide, the leading antimony consumers were China (40%), Europe (19%), and North America (17%) (Project Blue, 2023, p. 6).

Prices

In 2022, the average price of antimony was \$6.18 per pound (minimum 99.65% antimony, cost, insurance, and freight), 16% higher than that in 2021 (table 1). Because China dominated world antimony supply, its antimony market influenced antimony prices. The effects on global shipping issues from the global coronavirus disease 2019 (COVID-19) pandemic continued to significantly affect China's antimony ore supply chain from Burma. In addition, China experienced lower domestic antimony mine production owing to lower ore grades and reserves. It was expected in 2022 that PJSC Polyus' Olimpiada Mine in Russia, with an annual antimony production capacity of 23,000 t, would provide the additional antimony mine production needed for global market balance, but the company's focus was gold production and not antimony (Project Blue, 2023, p. 2, 20).

Foreign Trade

Domestic imports for consumption of antimony in 2022 far exceeded exports, which has been the case in recent years. Imports for consumption of antimony oxide (antimony content) in 2022 were 16,900 t, an 11% decrease from those in 2021 (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 2022 were 8,300 t, an 11% increase from those in 2021 (table 1). The leading suppliers of unwrought antimony to the United States were China (29%), the United Kingdom (20%), India (14%), and Oman (12%) (table 7). Exports of antimony oxide (antimony content) in 2022 were 2,420 t compared with 1,530 t in 2021 (table 1). Japan (38%), Mexico (12%), Canada (10%), and Turkey (10%) were the leading destinations (table 5). Exports of unwrought antimony (gross weight) were 1,820 t compared with 921 t in 2021. The leading destinations were Canada (50%) and Mexico (31%) (table 4).

World Review

In 2022, global mine production of antimony was 83,100 t compared with 82,600 t in 2021 (tables 1, 8). China (48%) and Tajikistan (25%) were the leading global producers of mined antimony. Globally, consumption of primary and secondary antimony was estimated to be 179,000 t in 2022, essentially unchanged from that in 2021 (Project Blue, 2023, p. 10).

Australia.—Mandalay Resources Corp. (Canada) operated the Costerfield gold-antimony mine in the State of Victoria. In 2022, the mine produced 2,290 t of salable antimony, a 32% increase from 3,380 t in 2021. The Youle deposit, which contained higher grade ores, continued to be the primary source of ore in 2022,

but processed antimony grades were lower in 2022 than those in 2021 (Mandalay Resources Corp., 2022, p. 16; 2023, p. 16, 17).

China.—In 2022, China continued to be the dominant producer of mined antimony, accounting for an estimated 48% of global mine production (table 8). Antimony mine production was estimated to be 40,000 t in 2022, a 5% increase from that in 2021 (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. The production and export from these countries decreased owing to the continuing effects on global shipping issues that began during the COVID-19 pandemic. In addition, the Olimpiada Mine in Russia focused on gold production and limited antimony output in 2022 (Project Blue, 2023, p. 2). To counteract its import reliance on third-party ores, China began investing in gold-antimony ore deposits abroad, such as the Konchoch gold-antimony mine in Tajikistan, which was a joint venture with Tibet Huaayu Mining Co. and Talco Gold (Tajikistan). The project opened in April and was expected to produce 21,000 metric tons per year (t/yr) of antimony (Pirnazarov and Auyezov, 2021; Ibragimova, 2022). 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 leading antimony mines in terms of production in 2022. Olimpiada's antimony production capacity was estimated to be 23,000 t/yr (Project Blue, 2023, p. 20). However, the company was focused on gold production and, as of yearend 2022, and production of antimony concentrates was limited to a minor fraction of capacity. In 2022, the mine produced 4,390 t of antimony in flotation concentrate, a 76% increase from 2,500 t in 2021, but still much lower than the 11,000 t of antimony produced in flotation concentrate in 2020 (PJSC Polyus, 2022, p. 22).

Outlook

Ammunition and flame retardants are still expected to be the major end products of antimony domestically and worldwide as no major substitutes for its properties have entered the market. 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 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, and golf carts and in some standby batteries.

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TABLE 1
SALIENT ANTIMONY STATISTICS¹

(Metric tons, antimony content, unless otherwise specified)

	2018	2019	2020	2021	2022
United States:					
Smelter production:					
Primary ²	331	377	254	19	W
Secondary	4,090	4,140	3,520	4,050	4,100
Exports:					
Ore and concentrate	38	9	10	9	53
Unwrought antimony and antimony articles ³	497	370	393	921	1,820
Antimony oxide ⁴	1,750	1,570	1,230	1,530	2,420
Waste and scrap	9	14	11	136	26
Imports for consumption:					
Ore and concentrate	96	121	105	31	29
Unwrought antimony and antimony articles ⁵	6,320	6,670	5,520	7,480	8,300
Antimony oxide ⁴	19,200	17,200	15,000	19,100	16,900
Waste and scrap	202	17	6	13	71
Apparent consumption of antimony ⁶	27,700	26,500	22,600	28,200	25,100
Reported industrial consumption, primary antimony	6,260	5,810	5,530 ^r	6,510 ^r	6,770
Price, average ⁷	8,410	6,695	5,895	11,701	13,633
Price, average ⁷	3.81 ^r	3.04 ^r	2.67	5.31	6.18
World, mine production ⁸	155,000	134,000	114,000	82,600	83,100

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

¹Table includes data available through September 22, 2023. Data are rounded to no more than three significant digits, except prices.

²Includes residual antimony from primary antimony consumption and antimony produced at the primary antimony facility. Source: U.S. Antimony Corp., 2020, Antimony, gold & silver, zeolite production information: Thompson Falls, MT, U.S. Antimony Corp. (Accessed August 21, 2021, via <https://www.nasdaq.com/market-activity/stocks/uamy/sec-filings/>).

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 metal, and antimony oxides. Primary production is not included in the formula for 2021 and 2022.

⁷U.S. price for antimony is minimum 99.65%, cost, insurance, and freight. Source: Argus Media Group, Argus Nonferrous Metals.

⁸May include estimated data.

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

(Metric tons, antimony content)

Class of material consumed	2021	2022
Metal	2,100	2,230
Oxide	3,650 ^r	3,800
Other ²	762 ^r	741
Total	6,510 ^r	6,770

^rRevised.

¹Table includes data available through September 22, 2023. 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	2021	2022
Metal products:		
Antimonial lead	W	W
Bearing metal and bearings	7	11
Solder	19	14
Other ²	2,720 ^r	2,880
Total	2,740	2,900
Nonmetal products:		
Ammunition primers	W	W
Ceramics and glass	205 ^r	187
Pigments	W	W
Plastics	589	512
Other ³	762 ^r	764
Total	1,560 ^r	1,460
Flame retardants:		
Adhesives	34	40
Plastics	1,700	1,780
Pigments	--	--
Rubber	102 ^r	125
Textiles	381	458
Total	2,210 ^r	2,400
Grand total	6,510 ^r	6,770

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

¹Table includes data available through September 22, 2023. 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	2021		2022	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Unwrought antimony: ²				
Argentina	--	--	25	\$79
Australia	1 ^r	\$4	1	4
Brazil	28	88	21	65
Canada	347	1,070	902	2,810
Cayman Islands	(3)	13	--	--
China	(3)	3	57	175
Czechia	2	5	3	10
France	2	13	5	89
Georgia	1	3	--	--
Germany	9	26	18	83
Hong Kong	9	29	5	16
Hungary	--	--	(3)	18
India	1	8	13	101
Ireland	--	--	(3)	6
Israel	5	16	39	120
Italy	12	38	15	50
Japan	8	42	29	150
Jordan	--	--	5	14
Korea, Republic of	(3)	4	10	44
Kuwait	--	--	3	10
Malaysia	12	38	3	20
Mexico	411	2,390	557	2,880
Panama	5	73	--	--
Peru	14	44	--	--
Philippines	2	11	21	64
Poland	2	106	3	92
Portugal	--	--	(3)	9
Qatar	2	7	5	15
Saudi Arabia	3	8	--	--
Singapore	--	--	2	5
Spain	8	25	8	25
Sweden	1 ^r	7	1	19
Switzerland	16	51	10	30
Taiwan	11	35	14	47
Thailand	--	--	7	43
Turkey	--	--	1	4
United Kingdom	2	20	38	80
Venezuela	5	94	--	--
Vietnam	2 ^r	5	--	--
Total	921	4,280	1,820	7,170
Waste and scrap: ⁴				
Canada	79	533	--	--
Chile	11	48	--	--
Mexico	45	95	26	66
Total	136	676	26	66

^rRevised. -- Zero.

¹Table includes data available through August 16, 2023. Data are rounded to no more than three significant digits; may not add to totals shown.

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

³Less than ½ unit.

⁴Schedule B number 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	2021			2022		
	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)
Australia	2	2	\$16	22	19	\$97
Austria	--	--	--	1	1	12
Belgium	80	67	300	79	66	466
Belize	--	--	--	1	1	8
Brazil	205	170	846	159	132	1,120
Canada	35	29	167	301	250	1,400
Chile	6	5	55	--	--	--
China	220	182	621	93	77	453
Colombia	39	32	309	--	--	--
Costa Rica	--	--	--	84	70	219
Denmark	(3)	(3)	4	(3)	(3)	8
France	42	35	164	137	114	375
Germany	11	9	120	38	32	175
Hong Kong	--	--	--	(3)	(3)	3
Indonesia	39	32	308	17	15	159
Italy	26	21	215	56	46	157
Japan	827	686	4,370	1,100	917	4,160
Korea, Republic of	7	6	18	2	2	6
Mexico	89	74	623	344	285	906
Netherlands	70	58	234	70	58	576
Russia	27	22	69	--	--	--
Saudi Arabia	26	21	91	11	9	64
Singapore	13	10	42	44	37	115
South Africa	6	5	26	--	--	--
Trinidad and Tobago	--	--	--	70	58	181
Turkey	68	57	424	278	231	945
United Kingdom	3	2	22	6	5	25
Total	1,840	1,530	9,050	2,920	2,420	11,600

-- Zero.

¹Table includes data available through August 16, 2023. Data are rounded to no more than three significant digits; may not add to totals shown.

²Schedule B number 2825.80.0000 (antimony oxide). 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 LOCALITY¹

Class and country or locality	2021			2022		
	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	5	5	\$72	11	11	\$157
China	--	--	--	(3)	(3)	5
India	(3)	(3)	8	--	--	--
Italy	26	25 [†]	187	22	17	264
Mexico	2	1	14	--	--	--
Total	33	31	282	33	29	426
Antimony oxide:²						
Austria	--	--	--	(3)	(3)	2
Belgium	2,650	2,200	24,900	2,460	2,040	31,100
Bolivia	951	789	7,540	1,200	998	13,200
Canada	45	37	470	40	33	527
China	17,300	14,400	115,000	15,300	12,700	141,000
France	825	684	8,130	645	536	7,840
Germany	--	--	--	20	17	248
India	15	12	134	35	29	433
Japan	202	167	945	397	330	1,900
Korea, Republic of	144	119	740	246	205	1,580
Mexico	60	50	226	94	78	286
Russia	--	--	--	3	3	15
Sweden	(3)	(3)	3	--	--	--
Thailand	781	648	1,990	--	--	--
United Kingdom	(3)	(3)	3	--	--	--
Total	23,000	19,100	160,000	20,400	16,900	198,000

[†]Revised. -- Zero.

¹Table includes data available through August 17, 2023. 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 2825.80.0000 (antimony oxide and senarmontite). 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	2021		2022	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Unwrought antimony: ²				
Australia	1	\$14	--	--
Austria	--	--	(3)	\$4
Bolivia	80	706	142	1,720
Burma	457	3,090	90	1,090
Canada	1	305	1	343
China	1,740	16,600	2,410	31,300
Dominican Republic	1	45	53	1,250
France	4	80	2	56
Germany	1	71	(3)	26
India	2,100	18,300	1,170	15,400
Indonesia	26	234	--	--
Italy	--	--	(3)	5
Japan	197	1,450	53	829
Korea, Republic of	--	--	1	17
Mexico	123	1,440	83	1,000
Oman	424	3,930	1,000	12,600
Peru	12	120	--	--
Spain	--	--	1	10
Switzerland	--	--	19	240
Tajikistan	55	438	--	--
Thailand	1,040	9,760	855	10,100
United Kingdom	248	4,300	1,660	9,640
Vietnam	974	8,670	764	9,690
Total	7,480	69,500	8,300	95,300
Waste and scrap: ⁴				
China	--	--	1	82
Germany	(3)	29	(3)	30
Mexico	12	18	70	266
Total	13	48	71	378

-- Zero.

¹Table includes data available through August 17, 2023. 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 ½ 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 specified)

Country or locality	2018	2019	2020	2021	2022
Australia ²	2,173	2,032	3,903	3,380	2,292
Bolivia	3,110	2,747	2,629	3,084	3,000 ^e
Burma ^{e, 3}	2,640	4,800	1,300	4,600	4,600
Canada ²	5	5	2	2 ^e	2 ^e
China	95,300	79,900	61,000	38,000 ^e	40,000 ^e
Ecuador	9 ^e	1 ^e	--	--	--
Guatemala	-- ^e	100 ^e	80 ^e	80 ^e	24
Honduras	12 ^e	--	--	--	--
Iran ^e	600	400	400	500	500
Kazakhstan ^e	100	500	100	650	300
Kyrgyzstan	676	16	--	40	40
Laos	370	140	--	240	220 ^e
Mexico ^e	800	800	700	700	700
Pakistan	--	--	17	66	79 ^e
Russia	32,000 ^e	24,000 ^e	21,000 ^e	12,000 ^e	4,300
Tajikistan	15,240	16,000	21,000	16,777	21,000
Turkey	1,800 ^e	2,000 ^e	1,458	2,567	5,800 ^e
Vietnam ^{e, 4}	240	400	310	270 ^f	250
Total	155,000	134,000	114,000	82,600	83,100

^eEstimated. ^fRevised. -- Zero.

¹Table includes data available through October 24, 2023. All data are reported unless otherwise noted; totals may include estimated data. Totals and estimated data are rounded to 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 ore and concentrate imported from Burma by China, India, Singapore, and Thailand.

⁴Values were converted to antimony content (using a conversion factor of 40% antimony) from gross weight in metric tons, which was reported as follows: 2018—600; 2019—1,000; 2020—775; 2021—675; and 2022—625.