



2009 Minerals Yearbook

ANTIMONY

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A single company in the United States, in Montana, produced primary antimony metal and antimony oxide by upgrading imported antimony trioxide to a higher purity. Secondary antimony was recovered in lead alloy from scrapped lead-acid batteries at secondary lead smelters. The amount of antimony used by battery manufacturers was substantially lower than it was 10 years ago because of changing material requirements for batteries.

In 2009, about 35% of the primary antimony used in the United States went into flame retardants; most of the rest was used by the ceramic, chemical, glass, and transportation industries (table 3). Secondary antimony, which was derived almost entirely from recycled lead-acid batteries and contained in antimonial lead, was used in the manufacture of new batteries.

Antimony was mined as a principal product or was a byproduct of the smelting of base-metal ores in 10 countries. Nearly all the world's primary antimony was mined in China (91%). Bolivia, Russia, and South Africa each produced about 2% of world production (table 9).

Production

Mine.—Stockpile Reserves LLC (Lovelock, NV) had no production in 2009 from its reactivated Fencemaker Mine, 80 kilometers southeast of Lovelock. The mine produced a small amount of antimony-in-concentrate in 2007, which was the first domestic antimony mine production since 2000. The mine had a long history of intermittent antimony production dating back to the 1880s. Stockpile Reserves continued to seek additional funding and to cooperate with the Nevada regulatory authorities about required licenses and permits (Richard E. Brown, chief executive officer, Stockpile Reserves LLC, written commun., November 23, 2010).

Silverado Gold Mines Ltd. (Vancouver, British Columbia, Canada) reported promising results at its Nolan Creek gold-antimony prospect in northern Alaska. Earlier investigations had established that the Workman's Bench deposit contained probable mineral reserves of 42,400 metric tons (t) grading 28% antimony. In 2009, Silverado conducted additional drilling in the Pringle Bench and the Workman's Bench deposits in an effort to increase gold and antimony resource potential. The company will be evaluating the findings (Silverado Gold Mines Ltd., 2009).

Smelter.—The United States has only one antimony smelter, U.S. Antimony Corp. (USAC) (Thompson Falls, MT). 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 taken to landfill sites.

Consumption

Of the 132 companies to which a U.S. Geological Survey antimony consumption survey was sent, 61 firms responded, representing 51% of the data reported in table 2. Consumption data were estimated for the remaining 71 firms.

In 2009, consumption (reported and estimated) of primary antimony decreased by 17% from that in 2008 (table 2). The metal products usage category experienced a notable increase, the nonmetal products category notched a moderate decrease, and the flame retardants sector showed a major decrease, which resulted from the economic slowdown (table 3).

Lead-antimony alloys were used in ammunition, antifriction bearings, cable sheaths, corrosion-resistant pumps and pipes, roof sheet solder, and tank lining. Antimony trioxide was used to enhance the flame-retardant properties of plastics, rubber and textiles, and other combustibles. Antimony was also used as a decolorizing and refining agent in the manufacture of some forms of glass, such as optical glass.

Prices

In 2009, the average price of antimony was \$2.36 per pound, a decrease of 16% compared with that in 2008 (table 1). Antimony prices started the year at \$1.93 per pound and rose slowly during the year to finish December at \$2.90 per pound. Industry sources attributed the price increase to a marked decrease in world antimony mine output.

Foreign Trade

U.S. imports of antimony in 2009 were, as has been the case in the recent past, much larger than exports—about 10-fold larger (tables 5–8). Imports of antimony were 20,200 t, a decrease of 30% from that in 2008. China was the leading supplier to the United States of antimony metal and antimony oxide, and Bolivia was the leading supplier of antimony ore and antimony concentrate (tables 7–8).

World Review

Australia.—Anchor Resources Ltd. (Sydney, New South Wales) completed an access agreement with a local landowner to allow exploration to start at its Bielsdown antimony project (formerly Wild Cattle Creek antimony mine) in New South Wales. The company completed a 10-hole drilling program in May (Anchor Resources Ltd., 2009, p. 3).

Canada.—Hunan Nonferrous Metals Corp. (HNC) (Changsa, Hunan Province, China), an integrated metals producer, agreed to acquire a 100% equity interest in Beaver Brook Antimony Mine Inc. (Gander, Newfoundland), one of the relatively few operating antimony producers outside of China. The 550-metric-

ton-per-day (t/d) underground mine has an estimated lifespan of 10 years (Riley, 2009).

China.—Chenzhou Mining Group Co., Ltd. (Guanzhuang, Yuanling Province) acquired the Zhazixi Antimony Mine (Anhua, Hunan Province). Zhazixi has a production capacity of 150,000 metric tons per year (t/yr) of antimony ore, and also has a production capacity to produce 3,000 t/yr of refined antimony (China Metal Market—Precious & Minor Metals, 2009).

The Government of China announced changes in its export quotas for antimony and several other metals for 2009. The 2009 export quota for antimony and antimony products was 58,700 t, compared with 59,900 t in 2008 (Platts Metals Week, 2008).

Hsikwangshan Twinkling Star Co. Ltd. (Lengshuijiang, Hunan Province) suspended production at its underground antimony mines in southeast-central China following an accident in October that left 26 people dead. The accident was at Hsikwangshan's main mine, and all underground mining was halted. The accident occurred after the brakes in two of the mine's lifts malfunctioned. The company was the world's leading producer of antimony, with an ore production capacity of 55,000 t/yr and 40,000 t/yr of antimony products. The lack of normal production from the important mine contributed to the surge in antimony prices in 2009 (Wallop, 2009).

Mexico.—USAC received permits to construct and operate an antimony concentrating mill in Mexico after a 3-year wait. The site of the new mill in Queretaro was close to USAC's existing Mexican antimony and silver properties and antimony smelter. USAC intended to transport its prefabricated flotation mill from its base in Montana and assemble it in Mexico to begin an initial production of 150 t/d of feed in early 2010. USAC anticipated that each metric ton of mill feed may contain 17 kilograms (kg) of antimony and 0.25 kg of silver. The mill site offered USAC the potential to increase the mill capacity of antimony and antimony oxide severalfold in the future (Industrial Minerals, 2009).

Outlook

The use of antimony as an ingredient in flame retardants was expected to remain its principal use, for global as well as for U.S. markets.

Antimony recovered from scrap has long been an important part of the total antimony supply domestically, but the recovery decline during the past 30 or more years is expected to continue,

though at a more moderate rate. Following the advent in the 1970s of low-maintenance and maintenance-free automotive batteries, the antimony content of a typical automotive lead-acid battery in 2009 had fallen to about 0.6% or lower.

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 would make lead-acid batteries viable options for future generation vehicles. The introduction of new lead-acid battery technologies for use in the hybrid vehicle market will likely require a different amount of lead per battery than conventional lead-acid batteries and could eventually reduce or eliminate the use of antimony in lead-acid batteries.

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Other

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TABLE 1
SALIENT ANTIMONY STATISTICS¹

(Metric tons of antimony content unless otherwise specified)

	2005	2006	2007	2008	2009	
United States:						
Mine production	--	--	W	--	--	
Smelter production:						
Primary	W	W	W	W	W	
Secondary	3,620 ^r	3,520	3,480	3,180 ^r	3,020	
Exports:						
Metal, alloys, waste and scrap	gross weight	740	459	305	366	385
Antimony oxide ²		1,400	1,680	1,640	1,830	1,710
Imports for consumption		22,700	23,200	21,900	29,000	20,200
Reported industrial consumption, primary antimony		9,140	10,400	9,590	8,140 ^r	6,770
Stocks, primary antimony, all classes, December 31		2,110	2,120	1,900	1,490 ^r	1,420
Price, average ³	cents per pound	160.5	238.0	257.3	279.5	235.6
World, mine production		172,000	173,000 ^r	180,000	182,000 ^r	155,000 ^e

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

¹Data are rounded to no more than three significant digits, except prices.

²Antimony content is calculated by the U.S. Geological Survey.

³New York dealer price for 99.5% to 99.6% metal, cost, insurance, freight U.S. ports.

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

(Metric tons of antimony content)

Class of material consumed	2008	2009
Metal	1,380	1,160
Oxide	6,100 ^r	5,000
Other ²	663 ^r	616
Total	8,140 ^r	6,770

^rRevised.

¹Data 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 of antimony content)

Product	2008	2009
Metal products:		
Antimonial lead	W	W
Bearing metal and bearings	18	14
Solder	54	44
Other ²	1,610	1,950
Total	1,690	2,000
Nonmetal products:		
Ammunition primers	W	W
Ceramics and glass	259	W
Pigments	448	403
Plastics	W	W
Other ³	1,970	2,030
Total	2,680	2,430
Flame retardants:		
Adhesives	610	217
Plastics	2,290 ^r	1,830
Rubber	42 ^r	42
Textiles	235	206
Other ⁴	20	40
Total	3,190 ^r	2,340
Grand total	8,140 ^r	6,770

^rRevised. W Withheld to avoid disclosing company proprietary data; included in "Other."

¹Data 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.

⁴Includes paper and pigments.

Note: Secondary antimonial lead production was 3,180 metric tons (t) in 2008 and 3,020 t in 2009.

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

(Metric tons of antimony content)

Type of material	2008	2009
Metal	217	154
Oxide	916 ^r	899
Other ²	357	363
Total	1,490 ^r	1,420

^rRevised.

¹Data 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 COUNTRY¹

Country	2008		2009	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Belgium	41	\$224	--	--
Canada	6	33	85	\$433
China	24	75	5	29
Colombia	20	66	3	20
France	2	7	39	503
Germany	45	166	8	25
India	48	149	17	66
Mexico	74	305	113	362
Netherlands	12	37	13	40
Sweden	41	128	34	104
Switzerland	14	48	3	59
Taiwan	11	35	12	37
United Kingdom	(2)	5	34	215
Venezuela	--	--	15	101
Other	27 ^r	86 ^r	3	9
Total	366	1,360	385	2,000

^rRevised. -- Zero.

¹Data 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 6
U.S. EXPORTS OF ANTIMONY OXIDE, BY COUNTRY¹

Country	2008			2009		
	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)
Australia	11	9	\$47	28	23	\$105
Belgium	163	135	1,150	17	14	135
Canada	211	175	737	218	181	1,210
Chile	5	4	34	2	2	11
China	87	72	418	44	37	175
Colombia	38	32	220	20	17	96
Costa Rica	13	11	65	2	2	13
France	17	14	61	14	12	61
Germany	185	154	821	49	41	276
Hong Kong	51	42	137	58	48	150
India	23	19	122	63	52	205
Indonesia	17	14	71	54	45	265
Italy	21	17	104	14	12	47
Japan	217	180	919	128	106	596
Korea, Republic of	51	42	162	54	45	203
Mexico	571	474	3,040	993	824	4,950
Netherlands	63	52	222	61	51	282
Singapore	18	15	160	2	2	23
South Africa	14	12	43	52	43	172
Spain	10	8	72	4	3	6
Taiwan	215	178	912	34	28	109
Thailand	70	58	284	16	13	61
United Kingdom	120	100	315	119	99	435
Other	8 ^r	7 ^r	42 ^r	10	8	69
Total	2,200	1,830	10,200	2,060	1,710	9,660

¹Revised.

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

²Antimony content is calculated by the U.S. Geological Survey.

Source: U.S. Census Bureau.

TABLE 7
U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY, BY CLASS AND COUNTRY¹

Country	2008			2009		
	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 concentrate:						
Bolivia	129	88	\$501	121	83	\$521
Canada	2	2	6	(3)	(3)	4
China	154	74	317	62	40	109
Italy	--	--	--	85	43	375
Japan	1	(3)	5	--	--	--
Total	286	164	828	268	167	1,010
Antimony oxide:						
Belgium	1,920	1,590	11,700	1,860	1,540	9,520
Bolivia	97	81	498	1,940	1,610	8,180
China	14,500	12,100	63,300	11,200	9,310	43,100
France	--	--	--	456	378	2,850
Germany	23	19	105	(3)	(3)	7
Hong Kong	20	17	43	--	--	--
India	23	19	122	--	--	--
Japan	169	140	1,470	182	151	1,040
Mexico	9,200	7,640	46,100	2,430	2,020	14,700
Netherlands	4	3	91	154	128	1,080
Taiwan	195	162	824	115	95	557
Vietnam	20	17	51	(3)	(3)	--
Other	5 ^r	4 ^r	59 ^r	(3)	(3)	21
Total	26,200	21,800	124,000	18,300	15,200	81,000

^rRevised. -- Zero.

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

²Antimony ore and concentrate content reported by the U.S. Census Bureau. Antimony oxide content is 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, BY COUNTRY¹

Country	2008		2009	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Australia	46	\$283	95	\$398
Bolivia	120	636	58	236
China	5,190	22,400	3,040	14,900
Hong Kong	384	2,230	--	--
India	--	--	10	82
Mexico	865	1,130	1,170	1,740
Peru	433	2,470	212	995
United Kingdom	1	17	44	362
Vietnam	19	127	119	590
Other	1 ^r	423 ^r	(2)	279
Total	7,050	29,700	4,750	19,600

^rRevised. -- Zero.

¹Data 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^{1,2}

(Metric tons, antimony content unless otherwise specified)

Country ³	2005	2006	2007	2008	2009 ^e
Australia ^{e,4}	120	1,600	1,010	1,500	1,000
Bolivia	5,098	5,460	3,881	3,905 ^r	3,000
Canada ⁵	66	226	162	97	56
China ^e	152,000	153,000	163,000	166,000 ^r	140,000
Guatemala	1,007	--	1,000 ^e	-- ^r	-- ⁶
Kyrgyzstan ^e	10	50	10	10	10
Peru, refined ^e	807 ⁶	691 ^r	590 ^r	531 ^r	530 ^p
Russia, recoverable ^e	3,000	3,500	3,500	3,500	3,500
South Africa ⁵	5,979	4,362	3,354	3,370 ^r	2,800
Tajikistan ^e	2,000	2,000	2,000	2,000	2,000
Thailand, content of ore and concentrate	347	1,409	--	--	--
Turkey ^e	1,200	1,100	1,200	1,300	1,700
Total	172,000	173,000 ^r	180,000	182,000 ^r	155,000

^eEstimated. ^pPreliminary. ^rRevised. -- Zero.

¹World totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Table includes data available through May 18, 2010.

³In addition to the countries listed, antimony may have been produced in Iran, but information is inadequate to estimate output.

⁴Antimony content of antimony ore and concentrate, lead concentrates, and lead-zinc concentrates.

⁵Antimony content of concentrate.

⁶Reported figure.