



2011 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 2011, about 34% of the primary antimony used in the United States was in 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 nine countries. Nearly all the world's primary antimony was mined in China (84%). Canada (6%), South Africa (3%), and Bolivia (2%) also produced antimony (table 9).

Production

Mine.—Stockpile Reserves LLC (Lovelock, NV) had no production in 2011 from its partially reactivated Fencemaker Mine, 80 kilometers (km) southeast of Lovelock. The mine had 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.

Midas Gold Corp. (Vancouver, British Columbia, Canada) reported results from its 2011 drilling program at its Golden Meadows project in Idaho. Its drilling in the Hangar Flats and Yellow Pine areas intersected significant gold-silver-antimony mineralization. Antimony was produced from the Yellow Pine deposit from the 1930s through the early 1950s (Midas Gold Corp., 2011).

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 102 companies to which a U.S. Geological Survey antimony consumption survey was sent, 65 firms responded. Consumption data were estimated for the remaining 37 firms.

In 2011, consumption (reported and estimated) of primary antimony increased by 15% from that in 2010 (table 2). All three categories of consumption (metal products, nonmetal products, and flame retardants) registered increases. Industry sources attributed the increases to higher demand in selected commercial sectors (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 2011, the average Platts Metals Week New York dealer price of antimony was \$6.50 per pound, an increase of 62% compared with that in 2010 (table 1). The antimony price started the year at \$5.50 to \$5.70 per pound, finished the first quarter at \$7.50 to \$7.85 per pound, then fluctuated in the \$6.15 to \$7.85 per-pound range through the next 3 quarters, and finished the year at \$6.70 to \$7.20 per pound. Industry sources attributed the stronger prices to a modest increase in world consumption and continued closure of several antimony mines in China that constrained supplies.

Foreign Trade

U.S. imports of antimony in 2011 were, as has been the case in the recent past, much larger than exports—about sixfold larger (tables 5–8). Imports of antimony in concentrate, metal, and oxide were 23,500 metric tons (t), a decrease of 10% compared with that in 2010. China was the leading supplier to the United States of antimony metal and antimony oxide (tables 7–8).

World Review

Australia.—Ancoa NL (Perth, Western Australia), formerly known as Resources Pty. Ltd. (Perth) reached an agreement with Straits Resources Ltd. (West Perth, Western Australia) to acquire the Hillgrove antimony-gold mine (New South Wales) in which Straits would receive \$21 million in cash and \$21 million in Ancoa shares. The Hillgrove Mine was inactive, but Ancoa planned to have the mine operational by September 2012. Straits had acquired the mine in 2005, but produced material for less than 1 year before putting the project on a care-and-maintenance status in 2009 because of technical problems with the new processing plant. Ancoa planned to produce two different concentrates, and ultimately produce 4,500 metric tons per year of antimony and 778 kilograms per year of gold (Smith, 2011).

¹Deceased.

Canada.—Portage Minerals Inc. (Toronto, Ontario) signed a nonbinding letter of intent with Tri-Star Resources Plc (London, United Kingdom) in which Tri-Star would fund \$12.5 million in exploration and development expenditures related to the Bald Hill antimony project in New Brunswick, to earn a 50.1% interest in the project. Portage considered the Bald Hill antimony project to be a significant new discovery in the region, hosting major antimony deposits similar to the past-producing Lake George Mine in New Brunswick, as well as the Beaver Brook Mine in Newfoundland (Portage Minerals Inc., 2011).

China.—Trade reports indicated China's increasing dependence on imported antimony concentrates. Important suppliers to China included Australia, Burma, Canada, Russia, Tajikistan, and Thailand (Metal-Pages, 2012).

The Government of China announced a slight reduction in export quotas for antimony in 2012 to 59,400 t from 60,000 t in 2011 (Platts Metals Week, 2012).

China Minmetals Corp. (Beijing), China's leading metals trader, announced plans to double its profits by 2015 as it expands output and speeds up acquisitions of rare-earth and minor-metals production facilities. Minmetals completed the acquisition of a 51% stake in Hunan Nonferrous Metals Holding Group Co. in 2010. The firm owned China's largest deposits of antimony and was China's leading antimony producer (Bloomberg News, 2011).

Inner Mongolia Yulong Mine Co., Ltd. (Chifeng City) completed a survey at its Hua'aobao silver-lead-zinc mine and discovered antimony in the associated minerals. The antimony reserves were estimated to be 155,000 t at a grade of 0.69% (China Metal Market—Precious & Minor Metals, 2011).

Mexico.—USAC announced that its antimony flotation mill at San Luis de la Paz in Mexico was in the final phase of testing before coming onstream in September. The 150-metric-ton-per-day mill was designed to produce a high-grade concentrate from the Los Juarez antimony-silver-gold property in Mexico's silver belt as well as from ore from other properties. USAC's proprietary metallurgical capability to extract precious metals from antimony deposits would allow it to recover precious metals from its Los Juarez property (The Street.com, 2011).

Russia.—GeoProMining Ltd. (Moscow) was the second-leading antimony producer in the world outside of China, and just behind USAC. GeoProMining produced 6,350 t of antimony-in-concentrates from its operations in Yakutia during 2011. Much of this concentrate was shipped to Chinese smelters (Mining Journal, 2011).

Outlook

The use of antimony as an ingredient in flame retardants was expected to remain its principal use, in global as well as 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 was 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 has declined to about 0.6% or lower during 2001 to 2011.

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)

	2007	2008	2009	2010	2011
United States:					
Mine production	NA ^r	--	--	--	--
Smelter production:					
Primary	W	W	W	W	W
Secondary	3,480	3,180	3,020	3,520	3,230
Exports:					
Metal, alloys, waste and scrap <u>gross weight</u>	305	366	385	427	581
Antimony oxide ²	1,640	1,830	1,710	2,120	3,590
Imports for consumption	21,900	29,000	20,200	26,200	23,500
Reported industrial consumption, primary antimony	9,690	8,140	6,770	8,860 ^r	10,200
Stocks, primary antimony, all classes, December 31	1,900	1,490	1,420	1,560	1,430
Price, average ³ <u>cents per pound</u>	257.3	279.5	235.6	401.2	650.3
World, mine production	180,000	183,000 ^r	154,000	175,000 ^r	178,000 ^c

^rEstimated. ^rRevised. NA Not available. 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	2010 ^r	2011
Metal	1,330	1,450
Oxide	6,940	7,190
Other ²	585	1,580
Total	8,860	10,200

^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	2010	2011
Metal products:		
Antimonial lead	W	W
Bearing metal and bearings	26	20
Solder	34	30
Other ²	2,070 ^r	2,930
Total	2,130 ^r	2,980
Nonmetal products:		
Ammunition primers	W	W
Ceramics and glass	W	W
Pigments	399	387
Plastics	W	W
Other ³	3,140	3,330
Total	3,540	3,720
Flame retardants:		
Adhesives	213	139
Plastics	2,610	3,090
Rubber	36	39
Textiles	322 ^r	253
Other ⁴	9	--
Total	3,190 ^r	3,520
Grand total	8,860 ^r	10,200

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

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 3,520 metric tons (t) in 2010 and 3,230 t in 2011.

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

(Metric tons of antimony content)

Type of material	2010	2011
Metal	124 ^r	182
Oxide	1,060	839
Other ²	372	408
Total	1,560	1,430

^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	2010		2011	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Belgium	38	\$434	--	--
Canada	103	391	159	\$812
China	3	42	19	82
Egypt	--	--	9	129
France	13	366	--	--
Germany	7	27	3	9
India	81	249	14	44
Japan	6	19	19	58
Korea, Republic of	16	49	48	303
Mexico	82	372	56	1,160
Netherlands	2	6	100	601
Poland	8	25	13	41
Taiwan	22	71	21	69
Trinidad and Tobago	8	47	--	--
United Kingdom	34	117	4	83
Venezuela	(2)	4	104	2,030
Other	4 ²	15 ²	12	114
Total	427	2,230	581	5,530

²Revised. -- 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	2010			2011		
	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)
Australia	20	17	\$55	66	55	\$341
Belgium	16	13	114	11	9	49
Brazil	20	17	118	24	20	115
Canada	238	198	1,780	228	189	1,510
Chile	56	46	159	81	67	263
China	132	110	389	123	102	928
Colombia	81	67	633	376	312	1,380
Costa Rica	20	17	117	181	150	495
France	25	21	83	30	25	112
Germany	166	138	810	316	262	2,070
Hong Kong	80	66	208	19	16	58
India	--	--	--	10	8	28
Indonesia	27	22	164	30	25	247
Israel	--	--	--	47	39	554
Italy	(3)	(3)	7	88	73	388
Japan	104	86	380	229	190	1,220
Korea, Republic of	229	190	774	278	231	824
Mexico	474	393	3,130	1,160	963	3,740
Netherlands	80	66	463	--	--	--
Peru	--	--	--	129	107	336
Singapore	76	63	235	125	104	466
South Africa	9	7	40	5	4	17
Taiwan	95	79	479	106	88	756
Thailand	40	33	108	43	36	113
United Kingdom	538	447	1,620	425	353	1,290
Venezuela	14	12	122	175	145	456
Other	10	9	42	17	14	50
Total	2,550	2,120	12,000	4,320	3,590	17,800

-- Zero.

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.

³Less than ½ unit.

Source: U.S. Census Bureau.

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

Country	2010			2011		
	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	70	49	\$332	1	1	\$9
Canada	--	--	--	(3)	(3)	11
China	20	20	52	61	56	381
Italy	218	112	1,450	340	223	3,680
Other	--	--	--	18	8	70
Total	308	181	1,840	420	288	4,150
Antimony oxide:						
Belgium	2,240	1,860	16,500	2,100	1,750	24,500
Bolivia	719	597	5,060	1,270	1,050	15,600
China	19,100	15,800	107,000	15,600	12,900	139,000
France	156	130	1,070	37	31	459
Japan	364	302	2,000	365	303	2,400
Mexico	1,940	1,610	10,600	1,210	1,010	11,500
Netherlands	134	111	925	--	--	--
Taiwan	236	196	1,150	171	142	1,060
Thailand	--	--	--	1,170	973	2,340
Other	26	21	173	(3)	(3)	28
Total	24,900	20,600	144,000	21,900	18,200	197,000

-- 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	2010		2011	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Australia	194	\$891	--	--
Belgium	--	--	94	\$655
Bolivia	18	90	67	794
China	4,530	35,600	3,620	47,800
Hong Kong	19	202	57	811
India	43	413	607	8,120
Japan	56	163	97	341
Mexico	363	495	309	686
Netherlands	--	--	40	595
United Kingdom	50	424	142	596
Vietnam	79	633	--	--
Other	4	158	4	310
Total	5,360	39,100	5,040	60,700

-- Zero.

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

Source: U.S. Census Bureau.

TABLE 9
ANTIMONY: WORLD MINE PRODUCTION, BY COUNTRY^{1,2}

(Metric tons, antimony content unless otherwise specified)

Country ³	2007	2008	2009	2010	2011 ^e
Australia ^{e,4}	1,010	1,500	1,000	1,000	1,100
Bolivia	3,881	3,905	2,990	4,980	3,947 ⁵
Canada ⁶	193	132	66	9,000 ^{r,e}	10,000
China ^e	163,000	166,000	140,000	150,000	150,000
Guatemala	1,000 ^e	--	--	--	--
Kyrgyzstan ^e	10	10	10	10	10
Peru, refined ^e	590	531	530	-- ^r	--
Russia, recoverable ^e	3,500	3,500	3,500	3,000	3,300
South Africa ⁶	3,354	3,983 ^r	2,673 ^r	3,700 ^{r,e}	4,700
Tajikistan ^e	2,000	2,000	2,000	2,000	2,000
Turkey ^e	1,200	1,300	1,200	1,500	3,000
United States	NA	--	--	--	--
Total	180,000	183,000 ^r	154,000	175,000 ^r	178,000

^eEstimated. ^rRevised. NA Not available. -- 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 1, 2012.

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.

⁵Reported figure.

⁶Antimony content of concentrate.