2008 Minerals Yearbook

ANTIMONY [ADVANCE RELEASE]

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ANTIMONY

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A single company in Montana produced primary antimony metal and antimony oxide by upgrading imported antimony trioxide at 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.

About 42% of the primary antimony used in the United States during 2008 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 11 countries. Nearly all the world's primary antimony was mined in China (91%), Bolivia and Russia (2% each) (table 9).

Production

Mine.—Stockpile Reserves Inc. (Lovelock, NV) had no production in 2008 from its reactivated Fencemaker Mine, located 80 kilometers (km) 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 continued to seek additional funding and cooperate with the Nevada regulatory authorities (Richard Brown, Stockpile Reserves Inc., oral commun., August 5, 2009).

Silverado Gold Mines Ltd. (Vancouver, British Columbia, Canada), an exploration-stage company, announced continued promising results at its Nolan Creek gold-antimony prospect in Alaska. Silverado's drilling program goal was to increase probable reserves on the Workman's Bench part of the property. Currently, the company has found 42,000 metric tons (t) of ore reported to have a grade of 28% antimony or almost 12,000 t of antimony metal content (Silverado Gold Mines Ltd., 2009).

Smelter.—The United States had only one antimony smelter, U.S. Antimony Corp. (USAC), based in 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 133 companies to which a U.S. Geological Survey antimony consumption survey was sent, 63 firms responded representing 51% of the data reported in table 2. Consumption data were estimated for the remaining 70 firms.

In 2008, consumption (reported and estimated) of primary antimony decreased by 21% from that in 2007 (table 2). The metal products and the nonmetal products usage categories experienced notable declines, while the flame retardant category showed a moderate decrease. The metal and nonmetal products sectors were in capital intensive markets heavily impacted by the economic slowdown; the flame retardant category involves a variety of uses including children's clothing and toys, which were less affected by the slowdown (table 3).

Lead-antimony alloys were used in ammunition, antifriction bearings, automotive batteries, cable sheaths, corrosion-resistant pumps and pipes, roof sheet solder, and tank lining. Antimony trioxide was used to enhance the flame-retardant properties of rubber and textiles, plastics, 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 2008, the average price of antimony was $2.80 per pound compared with $2.57 per pound in 2007 (table 1). Antimony prices started the year in the range of $2.64 to $2.69 per pound and after a steady climb, reached a peak of $3.00 to $3.06 per pound by early November. During November and December the price declined sharply to $1.90 to $1.95 per pound by yearend, owing to the effects of the world economic slowdown.

Foreign Trade

U.S. imports of antimony in 2008 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 the same as in 2007. China was the leading supplier to the United States of antimony metal and antimony oxide, and China and Bolivia are the leading suppliers of antimony ore and antimony concentrate (table 7).

World Review

Australia.—Straits Resources Ltd. (West Perth, Western Australia) reopened the Hillgrove antimony, gold, and tungsten mine near Armidale in New South Wales after 4 years of development. Straits had invested $95 million in the project to date. The mine was acquired from a private company in 2004 for $6 million. The firm planned to produce 10,000 t of antimony, 20,000 troy ounces of gold, and 30 t of tungsten from the mine annually (Metal-Pages Ltd., 2008d).

Anchor Resources Ltd. (Sydney, New South Wales) announced that it had been given two new exploration licenses

over areas with significant historical antimony production in northeastern New South Wales. The exploration licenses were granted by the New South Wales Department of Primary Industries covering two old antimony producing areas. These licences were labeled as the Munga and Thunderbolts projects. The Thunderbolt project is located 40 km to the north northwest of the Hillgrove Mine, and the old Magword antimony mine is contained within the project. Reports indicate that production between 1941 and 1969 was more than 3,000 t of antimony with average grades of ore at about 21%. The Munga project is located 80 km to the southeast of the Hillgrove Mine. These two projects enhance the strength of Anchor's antimony portfolio which already has significant antimony resources at the 100%-owned Bellsdown Project. Anchor already defined an indicated and inferred resource of 459,000 t of antimony at a 3% grade, about 14,000 t of contained antimony, at its Bellsdown deposit (Metal-Pages Ltd., 2008a).

Canada.—VVC Exploration Corp. (Toronto, Ontario) announced that its partly owned Beaver Brook antimony mine was restarted in May. The mine, located in central Newfoundland about 60 km southwest of Gander, was operated by Roycefield Resources Ltd. (Moncton, New Brunswick), which had operated the mine in 1997, but closed in 1998 owing to declining antimony prices. The stibnite ore was expected to be mined underground using the overhead cut and fill method, with development waste and quarried rock used as a backfill. The ore would be fed to a 450-metric-ton-per-day mill that uses flotation to produce a concentrate grading about 62% stibnite. The stibnite concentrate was to be trucked to Halifax, Nova Scotia, for shipping to international markets. The mine has a workforce of about 100 people. The expected life of the mine is 10 years (CNW Group, 2008; Metal-Pages Ltd., 2008b).

China.—Events in China, the world's leading antimony producer, continued to limit antimony supplies on an international basis in the first few months of 2008. Producers in China struggled with transportation problems and government crackdowns, which included restrictions on the availability of detonators used to mine antimony ore. Rivers in southern China were dry following droughts in March, impeding the transportation of material. Authorities attempted to implement measures to reduce pollution in advance of the Olympic Games, which led to reduced antimony production at some facilities in the early part of 2008 (American Metal Market, 2008).

Japan.—Nippon Mining & Metals Co. Ltd. (Tokyo) announced that it would start operation for the first phase of its recycling plant, Hitachi Metal Recycling Complex (HMC) in late 2008. The facility would recover antimony, bismuth, nickel, and tin from recycled material at its subsidiary (Mikko Environmental Service in Ibaraki) and intermediate product at the Saganoseki smelter and refinery in Oita. Construction of the second phase would be completed in December 2008 and planned to recover 700 t of zinc and 6 t of indium. The third phase would be completed by March 2009 and would recover copper, gold, platinum, and silver. Nippon started testing the first phase in August and ultimately planned to recover 150 t of antimony, 200 t of bismuth, 500 t of nickel, and 500 t of tin (Metal-Pages Ltd., 2008c).

Laos.—Hoa Binh Xanh Co. (Hanoi, Vietnam) signed a $4 million antimony exploration agreement with the Laotian Government allowing it to explore an area of 380 square kilometers in the Luang Prabang Province of northern Laos for antimony ores. The exploration was to be carried out during the next 4 years. Minerals activity has emerged as one of Laos' major thrusts in recent years (Metal-Pages Ltd., 2008e).

Mexico.—United States Antimony Corp. (USAC) (Thompson Falls, MT) announced that its wholly owned Mexican subsidiary (Antimonio de Mexico S.A. de C.V.) received approval to build an ore processing plant near its San Miguel antimony-silver deposit. The Mexican permitting agency, Semarnat, authorized the company to allow the reclassification of the land for the construction of a mill to process antimony-, gold-, and silver-bearing minerals from the San Miguel deposit in the State of Queretaro. The San Miguel I and II claims are two of three properties on a mineralized zone that is more than 4.5 km long with a width of more than 50 meters (m) and a thickness of up to 10 m. Mining would be by open pit methods. The three properties cover 718 hectares. Mineralized rock from these properties would be hauled to the mill near Cadereyta in the State of Queretaro, where the company expected to produce high-grade antimony and silver concentrate with a gold credit. The mill was prefabricated at the USAC facility in Montana. It has a design capacity of 150 metric tons per day and would be located about 40 km from the deposit. Additional rock from the Soyatal Mining District, which is close to the mill, also may be processed there. Through 1943, the Soyatal District had produced 26,000 t of contained antimony metal, using hand-mining methods, which recovered less than 50% of the metal values. Concentrates from the mill would be transported to the USAMSA smelter (a wholly owned subsidiary of Antimonio de Mexico) located in the State of Coahuila. The smelter has been permitted and various modifications are almost complete, which will enable the plant to make a variety of antimony products (Metal-Pages Ltd., 2008f).

Outlook

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

Antimony recovered from old 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-maintenace and maintenance-free automotive batteries, the antimony content of a typical automotive lead-acid battery in 2008 had fallen to about 0.6% or lower. Industry sources think the antimony level in lead-acid batteries could reach zero by 2020.

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 SLI batteries and could eventually reduce or eliminate the use of antimony in lead-acid batteries.

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TABLE 1
SALIENT ANTIMONY STATISTICS[1]

(Metric tons of antimony content unless otherwise specified)

		2004	2005	2006	2007	2008
United States:						
Mine production		--	--	--	W	--
Smelter production:						
Primary		W	W	W	W	W
Secondary		3,650	3,030	3,520	3,480	3,080
Exports:						
Metal, alloys, waste and scrap	gross weight	566	740	459	305	366
Antimony oxide[2]		3,240	1,400	1,680	1,640	1,830
Imports for consumption		33,500	22,700	23,200	21,900	29,000
Reported industrial consumption, primary antimony		11,400	9,140	10,400	9,590	7,570
Stocks, primary antimony, all classes, December 31		2,830	2,110	2,120	1,900	1,620
Price, average[3]	cents per pound	130.3	160.5	238.0	257.3	279.5
World, mine production		142,000	172,000 r	174,000 r	180,000 r	197,000 e

[e]Estimated. [r]Revised. W Withheld to avoid disclosing company proprietary data. -- Zero.

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

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

[3]New 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 STATES[1]

(Metric tons of antimony content)

Class of material consumed	2007	2008
Metal	2,170 r	1,380
Oxide	7,330 r	6,110
Other[2]	86	77
Total	9,590	7,570

[r]Revised.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes residues and sulfide.

TABLE 3
REPORTED INDUSTRIAL CONSUMPTION OF PRIMARY ANTIMONY IN THE UNITED STATES, BY PRODUCT[1]

(Metric tons of antimony content)

Product	2007	2008
Metal products:		
Antimonial lead	W	W
Bearing metal and bearings	21	18
Solder	71	54
Other[2]	2,430	1,610
Total	2,520	1,690
Nonmetal products:		
Ammunition primers	W	W
Ceramics and glass	231	259
Pigments	329	448
Plastics	W	W
Other[3]	2,940	1,970
Total	3,500	2,680
Flame retardants:		
Adhesives	454	610
Plastics	2,710	2,300
Rubber	154	41
Textiles	252	235
Other[4]	10	20
Total	3,580	3,200
Grand total	9,590	7,570

W Withheld to avoid disclosing company proprietary data; included in “Other.”
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes ammunition, cable covering, castings, sheet and pipe, and type metal.
[3]Includes fireworks and rubber products.
[4]Includes paper and pigments.

Note: Secondary antimonial lead production was 3,480 metric tons (t) in 2007 (revised) and 3,180 t in 2008.

TABLE 4
INDUSTRY STOCKS OF PRIMARY ANTIMONY IN THE UNITED STATES, DECEMBER 31[1]

(Metric tons of antimony content)

Type of material	2007	2008
Metal	470 r	217
Oxide	1,410 r	1,050
Other[2]	18	357
Total	1,900	1,620

[r]Revised.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes ore and concentrate, residues, and sulfide.

TABLE 5
U.S. EXPORTS OF ANTIMONY METAL, ALLOYS, AND WASTE AND SCRAP, BY COUNTRY[1]

	2007		2008	
Country	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Belgium	2	$6	41	$224
Brazil	42	131	4	14
Canada	20	94	6	33
China	36	136	24	75
Colombia	--	--	20	66
Germany	36	112	45	166
India	--	--	48	149
Mexico	61	251	74	305
Netherlands	7	20	12	37
Sweden	48	154	41	128
Switzerland	25	95	14	48
Taiwan	--	--	11	35
Other	28 r	116 r	26	85
Total	305	1,120	366	1,370

[r]Revised. -- Zero.
[1]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[1]

Country	2007 Gross weight (metric tons)	2007 Antimony content[2] (metric tons)	2007 Value (thousands)	2008 Gross weight (metric tons)	2008 Antimony content[2] (metric tons)	2008 Value (thousands)
Belgium	28	23	$227	163	135	$1,150
Brazil	86	71	442	--	--	--
Canada	123	102	460	211	175	737
China	196	163	840	87	72	418
Colombia	139	115	762	38	32	220
Germany	116	96	460	185	154	821
Hong Kong	19	16	48	51	42	137
India	21	17	113	23	19	122
Italy	17	14	102	21	17	104
Japan	174	144	681	217	180	919
Korea, Republic of	93	77	194	51	42	162
Mexico	375	311	2,080	571	474	3,040
Netherlands	43	36	142	63	52	222
Sweden	171	142	444	--	--	--
Taiwan	80	66	386	215	178	912
Thailand	71	59	368	70	58	284
United Kingdom	18	15	71	120	100	315
Other	209 r	176 r	987 r	115	97	595
Total	1,980	1,640	8,810	2,200	1,830	10,200

[r]Revised. -- Zero.

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

[2]Antimony 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 COUNTRY[1]

Country	2007 Gross weight (metric tons)	2007 Antimony content[2] (metric tons)	2007 Value (thousands)	2008 Gross weight (metric tons)	2008 Antimony content[2] (metric tons)	2008 Value (thousands)
Antimony ore and concentrate:						
Belgium	17	11	$72	--	--	--
Bolivia	204	139	646	129	88	$501
Canada	--	--	--	2	2	6
China	59	55	293	154	74	317
Italy	33	22	101	--	--	--
Japan	--	--	--	1	(3)	5
Total	313	226	1,110	286	164	828
Antimony oxide:						
Belgium	2,050	1,700	11,400	1,920	1,590	11,700
Bolivia	--	--	--	97	81	498
China	14,000	11,600	54,900	14,500	12,100	63,300
Hong Kong	52	43	258	20	17	43
Japan	248	206	2,000	169	140	1,470
Mexico	9,600	7,970	48,500	9,200	7,640	46,100
Taiwan	--	--	--	195	162	824
Vietnam	80	66	251	20	17	51
Other	41	66	251	55	45	377
Total	26,100	21,700	117,000	26,200	21,800	124,000

-- Zero.

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

[2]Antimony ore and concentrate content reported by the U.S. Census Bureau. Antimony oxide content is calculated by the U.S. Geological Survey.

[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 8

U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY METAL, BY COUNTRY[1]

Country	2007 Quantity (metric tons)	2007 Value (thousands)	2008 Quantity (metric tons)	2008 Value (thousands)
Australia	--	--	46	$283
Belgium	613	$2,960	--	--
Bolivia	54	267	120	636
China	3,770	19,900	5,190	22,400
Hong Kong	240	1,190	384	2,230
Mexico	648	840	865	1,130
Peru	419	1,950	433	2,470
United Kingdom	--	--	1	17
Vietnam	157	842	19	127
Other	19	350	2	439
Total	5,920	28,300	7,050	29,700

-- Zero.

[1]Data 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]	2004	2005	2006	2007	2008[e]
Australia[e, 4]	120	120	1,600	1,010 r	1,500
Bolivia	2,633	5,098	5,460	3,881 r	3,500
Canada[5]	88 r	66 r	226 r	162 r	97 p
China[e]	125,000	152,000	153,000	163,000 r	180,000
Guatemala	2,686	1,007	--	1,000 r, e	1,000
Kyrgyzstan[e]	20	10	50	10 r	10
Peru, refined[e]	356	807 [6]	810	810	810
Russia, recoverable[e]	3,000	3,000	3,500	3,500	3,500
South Africa[5]	4,967	5,979	4,362	3,354 r	2,800
Tajikistan[e]	2,000	2,000	2,000	2,000	2,000
Thailand, content of ore and concentrate	52	347	1,409 r	--	--
Turkey[e]	700 r	1,200 r	1,100 r	1,200 r	1,300
Total	142,000	172,000 r	174,000 r	180,000 r	197,000

[e]Estimated. [p]Preliminary. [r]Revised. -- Zero.

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

[2]Table includes data available through May 19, 2009.

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

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

[5]Antimony content of concentrate.

[6]Reported figure.