

2006 Minerals Yearbook

ANTIMONY

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James F. Carlin, Jr.

Domestic survey data and tables were prepared by Samir Hakim, statistical assistant, and the world production table was prepared by Glenn J. Wallace, international data coordinator.

There was no domestic antimony mine production during 2006. Most domestic smelting consisted of upgrading imported antimony trioxide to a higher purity. Most primary antimony metal and antimony oxide were produced domestically from imported raw material. Primary antimony metal and antimony oxide were produced by one company in Montana. 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 earlier because of changing materials requirements for batteries.

About 37% of the primary antimony used in the United States during 2006 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. In 2006, the average price of antimony was 238 cents per pound and was 48% higher than that of 2005 (table 1).

Antimony was mined as a principal product or was a byproduct of the smelting of base-metal ores in 12 countries. World mine production declined by 5%. Nearly all the world's primary antimony was mined in China (82%), Bolivia (5%), South Africa (4%), Russia (3%), Tajikistan (2%), and Australia (1%) (table 9).

Production

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 152 companies to which a U.S. Geological Survey antimony consumption survey was sent, 81 firms responded. Consumption data were estimated for the remaining 71 firms. Reported and estimated U.S. consumption was less than one-half of net imports.

In 2006, consumption (reported and estimated) of primary antimony increased by 14% from that of 2005 (table 2). Consumption for most categories remained fairly steady except for the nonmetal products sector, which experienced a 53% increase in usage compared with that in 2005.

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, often dissolved in an organic solvent, 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 2006, antimony prices continued the strong upward trend that began in 2002. Antimony prices started the year in the range of \$1.82 to \$1.89 per pound and rose steadily, ending the first quarter at \$2.30 to \$2.35 per pound. Prices remained fairly steady in the second quarter. Prices rose somewhat in the third quarter to finish the third quarter at \$2.48 to \$2.58 per pound. Prices in the fourth quarter remained rather steady. The average antimony price for the year increased by 48% compared with that of 2005. The price increase was attributed to increased world demand coupled with a modest decrease in world mine output.

Trade

U.S. imports of antimony in 2006 were, as has been the case in the recent past, much larger than exports—about 11-fold larger (tables 5-8). Imports of antimony increased slightly from the level of 2005. China was the leading supplier to the United States of antimony metal and antimony oxide while Bolivia was the leading supplier of antimony ore and antimony concentrate.

World Review

Australia.—Straits Resources Ltd. of West Perth announced plans to construct an antimony processing facility at its Hillgrove antimony-gold-tungsten mine site in Australia. The facility, which would process antimony ore into antimony metal and gold, was slated to begin operations around June 2007. In its initial state, the mine was projected to produce 250,000 metric tons per year (t/yr) of antimony ore, and the plant would use the material as feed to produce 10,000 t/yr of antimony metal. Straits expects to expand output to 500,000 t/yr of ore in the future (Straits Resources Ltd., 2006, p. 4).

Zhong Nan Antimony and Tungsten Trading Co. Ltd. of Changsha, Hunan Province, China, announced that it had signed an agreement to take all the antimony concentrate from A.G.D. Mining Corp.'s Costerfield Mine in Australia. Reportedly, Zhon Nan would pay 65% of the prevailing antimony market price for contained antimony. Costerfield was expected to be commissioned in April 2006 and was expected to reach its full output of 5,500 t/yr of contained antimony by May 2006.

The mine would be an open pit operation for the first 12 to 18 months, followed by underground operations for the balance of its life, estimated to be 3 years based on probable reserves. The project was projected to cost \$9 million, which A.G.D. has raised through equity and a \$4 million loan from its parent company, Cambrian Mining Plc. (Metal-Pages, 2006c).

China.—The Government raised the minimum requirements for new upgraded projects in the antimony, tin, and tungsten industries in a bid to curb future expansions. The new requirements took effect on January 1, 2007, and included higher standards for capacity, recycling of resources, power consumption, environmental protection, and product quality. According to the National Development and Reform Commission, the new standards are intended to ensure better use of the country's metal resources and to enhance the Government's supervision over the industries. For antimony, all smelting projects must have a capacity of 5,000 t/yr or more (Metal Bulletin, 2007).

The Government ordered all illegal antimony mines and small smelters in Hunan Province to be closed for safety checks, following a fatal mine explosion in December. The affected smelters produce a total of 20,000 t/yr of antimony metal. The accident, reportedly caused by explosives, took place at the mine in Lengshuijiang City in central Hunan Province (Teo, 2006).

Industry sources report that antimony consumption in China has been at a record high. Strong domestic demand limited exports, which are restricted by the Government. Antimony production in China rose by 11% in the first 9 months of 2006 compared with production in the similar period of 2005, even though antimony refiners have been complaining about reduced raw material sources. Exports of antimony from China declined by 31% during the first 9 months of 2006 compared with those of the similar period of 2005. Export figures, however, are thought to be incomplete because large quantities of antimony shipped out of China were not reported (Ryan's Notes, 2006).

Hunan Nonferrous Metals Co. Ltd. (Changsa, China), the country's leading producer of antimony, announced that it planned to make an initial public offering of its stock in March. Hunan sought to raise from \$166 million to \$229 million through the public offering. The funds would be used to explore for or acquire new mineral resources, develop ore reserves at existing mines, and to change the company's product mix towards more value-added products. Among Hunan's subsidiaries is Xikuangshan Shanxing Antimony Corp., the world's leading producer of antimony with a production capacity of 40,000 t/yr. The company operated four plants and two mines (Metal-Pages, 2006a).

Korea, Republic of.—Korean Resources Corp. (Seoul) announced that the Government planned to stockpile strategic reserves of 14 minor metals including antimony. The Republic of Korea already maintained stockpiles of major base metals such as aluminum and copper. Plans called for the building of a warehouse in 2006 to house 85,000 metric tons (t) of the 14 metals, the equivalent of 2 months of import demand for the Republic of Korea. The Government planned to spend \$188 million during 10 years, beginning in 2007. The program was expected to stabilize the supply of these metals for the country's information technology industries (Metal-Pages, 2006b).

Mexico.—USAC (Thompson, MT) announced new developments at its 50%-owned subsidiary Antimonio de Mexico S.A. de C.V. USAC will proceed to refurbish the smelter, which had been idle for 7 years, at Antimonio in Estacion Madero, Coahuila, Mexico. USAC projected that Antimonio would produce 9,000 t/yr of antimony metal and antimony oxide after the smelter is refurbished. The company planned to start the smelter in 2006, initially using ore from third parties until it is able to bring a mine near Mexico City onstream at the end of 2006. The metal product will be shipped to USAC's plant in Thompson Falls, where gold and silver will be extracted, and 99%- to 99.5%-pure antimony will be produced. The Montana plant produces about 900 t/yr of antimony by reprocessing smelter byproducts (American Metal Market, 2006).

Outlook

The use of antimony as an ingredient in flame retardants is expected to remain its principal use. This is expected to be true 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 25 or more years is expected to continue. 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 2006 had fallen to about 0.6% or lower. Industry sources think the antimony level in lead-acid batteries could reach zero by 2020.

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Other

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$\label{eq:table 1} \textbf{TABLE 1} \\ \textbf{SALIENT ANTIMONY STATISTICS}^1$

(Metric tons of antimony content unless otherwise specified)

		2002	2003	2004	2005	2006
United States:						
Production:						
Primary		W	W	W	W	W
Secondary		5,350	5,600	3,650	3,030 ^r	3,480
Exports:						
Metal, alloys, waste and scrap gross v	weight	992	771	566	740	459
Antimony oxide ²		3,260	2,910	3,240	1,400	1,680
Imports for consumption		28,500	26,700	33,500	22,700 ^r	23,000
Reported industrial consumption, primary antimony		11,500	9,230	11,400	9,140 ^r	10,400
Stocks, primary antimony, all classes, December 31		5,060	6,320	2,830	2,110 ^r	2,110
Price, average ³ cents per	pound	88.4	107.5	130.3	160.5	238.0
World, mine production		118,000 ^r	116,000 ^r	144,000 ^r	142,000 ^r	134,000 e

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

TABLE 2 REPORTED INDUSTRIAL CONSUMPTION OF PRIMARY ANTIMONY IN THE UNITED STATES $^{\rm I}$

(Metric tons of antimony content)

	Class of	Class of material consumed				
Year	Metal	Oxide	Other ²	Total		
2005	1,530	7,520 ^r	89	9,140 ^r		
2006	1,600	8,700	119	10,400		

rRevised.

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.

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 PRODUCT $^{\rm l}$

(Metric tons of antimony content)

Product	2005	2006
Metal products:		
Antimonial lead	W	W
Bearing metal and bearings	33	20
Solder	81	61
Other ²	2,830	2,920
Total	2,940	3,000
Nonmetal products:		
Ammunition primers	W	W
Ceramics and glass	421	258
Pigments	530 ^r	215
Plastics	W	W
Other ³	1,410	3,130
Total	2,360 ^r	3,600
Flame retardants:		
Adhesives	W	664
Plastics	2,880	2,810
Rubber	115	122
Textiles	184	205
Other ⁴	652	10
Total	3,840	3,820
Grand total	9,140 ^r	10,400
[m]		

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

Note: Secondary antimonial lead production was 3,030 metric tons (t) in 2005 (revised) and an estimated 3,480 t in 2006.

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

(Metric tons of antimony content)

Type of material	2005	2006
Metal	417 ^r	421
Oxide	1,680 ^r	1,680
Other ²	17	15
Total	2,110 ^r	2,110

rRevised

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.

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 $\mbox{U.S. EXPORTS OF ANTIMONY METAL, ALLOYS, AND WASTE AND SCRAP, } \\ \mbox{BY COUNTRY}^1$

	20	005	2006		
	Gross weight	Gross weight Value		Value	
Country	(metric tons)	(thousands)	(metric tons)	(thousands)	
Canada	390	\$1,290	215	\$801	
Mexico	281	1,270	134	592	
Netherlands	(2)	36	14	60	
Sweden	14	236	39	147	
Switzerland		107	21	90	
Other	50	313	36	166	
Total	740	3,250	459	1,860	

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

Source: U.S. Census Bureau.

 $\label{eq:table 6} \text{U.S. EXPORTS OF ANTIMONY OXIDE, BY COUNTRY}^1$

		2005			2006			
		Antimony			Antimony			
	Gross weight	content ²	Value	Gross weight	content ²	Value		
Country	(metric tons)	(metric tons)	(thousands)	(metric tons)	(metric tons)	(thousands)		
Argentina				36	30	\$209		
Australia	118	98	\$322	19	16	104		
Belgium	69	57	198	64	53	230		
Brazil	11	9	53	146	121	620		
Canada	287	238	982	176	146	676		
Chile	_ 34	28	85	4	3	22		
China	65	54	280	174	144	726		
Colombia	20	17	27	68	56	295		
Costa Rica				21	17	95		
France	36	30	129	34	28	226		
Germany	_	2	5	120	100	411		
Italy	21	17	65	20	17	95		
Japan	76	63	317	396	329	1,560		
Korea, Republic of	_ 96	80	277	88	73	310		
Mexico	524	435	1,670	245	203	1,100		
New Zealand	10	8	48	15	12	99		
Pakistan	12	10	71					
Singapore	39	32	242	93	77	922		
South Africa				11	9	36		
Taiwan	41	34	293	69	57	333		
Thailand	21	17	71	11	9	56		
Turkey	1	1	8	20	17	44		
United Kingdom	100	83	402	24	20	125		
Other	98 ^r	82 ^r	309 r	164	138	583		
Total	1,680	1,400	5,860	2,020	1,680	8,870		

^rRevised. -- Zero.

Source: U.S. Census Bureau.

²Less than ½ unit.

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.

 $\label{eq:table 7} \text{U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY, BY CLASS AND COUNTRY}^1$

		2005			2006	
		Antimony		Antimony		
	Gross weight	content ²	Value	Gross weight	content ²	Value
Country	(metric tons)	(metric tons)	(thousands)	(metric tons)	(metric tons)	(thousands)
Antimony ore and concentrate:						
Belgium				5	4	\$28
Bolivia				181	130	526
China	150	147	\$443	20	20	99
Hong Kong	40	40	127			
Japan	(3)	(3) r	4			
Peru	18	17	48			
Total	207	204	622	205	153	653
Antimony oxide:						
Australia	(3)	(3)	5			
Belgium	1,870	1,550	5,660	2,030	1,680	7,410
Canada	1	1	8			
China	11,500	9,510	33,600	12,800	10,600	48,900
France	3	3	24	2	2	15
Germany	5	4	80	4	4	65
Hong Kong	176	146	522	20	17	96
Iceland	22	18	9			
Japan	239	199	2,580	268	222	1,990
Mexico	12,000	9,930	34,100	10,600	8,780	37,200
Netherlands				1	1	18
Switzerland	36	30	116			
United Kingdom				(3)	(3)	6
Vietnam	1,540	1,280	4,950	2,000	1,660	6,610
Total	27,300	22,700	81,600	27,700	23,000	102,000

Revised. -- Zero.

Source: U.S. Census Bureau.

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.

 ${\it TABLE~8}$ U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY METAL, BY COUNTRY $^{\rm I}$

	20	05	200)6	
	Quantity	Value	Quantity	Value	
Country	(metric tons)	(thousands)	(metric tons)	(thousands)	
Belgium	701	\$1,850	299	\$1,330	
Bolivia	20	50	40	192	
Canada	108	1,130	126	1,060	
Chile	20	50			
China	3,870	13,500	5,070	24,100	
Germany	(2)	104	(2)	99	
Hong Kong	135	446	19	78	
Japan	1	99	(2)	54	
Mexico	900	844	800	907	
Peru	461	1,590	846	3,610	
Russia	21	60			
Taiwan	19	73			
Vietnam	110	569	57	287	
Other	5	7	2	28	
Total	6,370	20,400	7,260	31,800	

⁻⁻ Zero.

Source: U.S. Census Bureau.

 ${\bf TABLE~9}$ ANTIMONY: WORLD MINE PRODUCTION, BY COUNTRY $^{1,\,2}$

(Metric tons, antimony content unless otherwise specified)

Country ³	2002	2003	2004	2005	2006 ^e
Australia ^{e, 4}	1,200	1,300	1,800 5	1,900	1,900
Bolivia	2,346 ^r	2,585 ^r	2,633 ^r	5,098 ^r	6,600
Canada ⁶	173	153	105 ^r	96 ^r	100 ^p
China ^e	100,000	100,000	125,000 ^r	120,000	110,000
Guatemala	4,010 ^r	2,000 r, e	2,686 ^r	1,007 ^r	1,000
Kyrgyzstan ^e	150	40	20	10	50
Peru, refined ^e	356 ⁵	356	356	807 ^{r, 5}	810 ^p
Russia, recoverable ^e	1,000	2,000	3,000	3,000	3,500
South Africa ⁶	5,746	5,291	4,967	5,979 ^r	6,000
Tajikistan ^e	3,000	1,800	2,000	2,000	2,000
Thailand, content of ore and concentrate	1	38	52	347 ^r	940
Turkey ^e	250	650	900	1,400 ^r	1,400
Total	118,000 r	116,000 ^r	144,000 ^r	142,000 ^r	134,000

^eEstimated. ^pPreliminary. ^rRevised.

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

²Less than ½ unit.

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 22, 2007.

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.