

ANTIMONY

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More than one-half of the primary antimony used in the United States during 2002 went into flame-retardants; most of the remainder was used by the transportation, chemical, ceramics, and glass industries. Secondary antimony, which was derived almost entirely from recycled lead-acid batteries, was used in the manufacture of new batteries. The average price of antimony was 35% higher than that of 2001.

There was no domestic antimony mine production during the year. Most primary antimony metal and oxide were produced domestically from raw material imports. Most domestic smelting consisted of upgrading imported antimony trioxide to a higher purity. Primary antimony metal and oxide were produced by two companies operating two plants—one in Montana and one in Texas. Secondary antimony was recovered from scrapped lead-acid batteries at secondary lead smelters. The amount of antimony used by battery manufacturers is substantially lower than it was 10 years ago because of changing materials requirements for batteries. Industry stocks rose slightly (table 1).

Antimony was mined as a principal product or was a byproduct of the smelting of base metal ores in 15 countries. Nearly all world primary antimony was mined in China (91%), South Africa (4%), Bolivia (2%), and Tajikistan (2%) (table 9).

Legislation and Government Programs

Sales of antimony by the Defense Logistics Agency (DLA) proceeded for the 10th consecutive year. Sales were conducted on a negotiated bid basis and were held bimonthly on the first Thursday of the month. There was no maximum limit to the quantity for which a company could submit a bid, but the minimum quantity was 18,144 kilograms (40,000 pounds). The materials offered were grade A and grade B ingots, cake, and broken pieces. The antimony sulfide ore inventory has been depleted. In calendar year 2002, approximately 4,627 metric tons (t) of antimony was sold. At calendar yearend 2002, the antimony inventory in the National Defense Stockpile (NDS) was 2,534 t. The NDS at Somerville, NJ, holds the remaining antimony inventory. The DLA anticipated selling the remaining antimony inventory by the end of 2003 (Defense Logistics Agency, 2002).

Production

Mine.—There was no domestic mine production in 2002. The Nation's sole domestic antimony producer in prior years, Sunshine Mining Co. in Idaho, closed its mine in early 2001.

Smelter.—The domestic producers of primary antimony metal and oxide products were Laurel Industries Inc., La Porte, TX, and U.S. Antimony Corp., Thompson Falls, MT. Both replied to

the U.S. Geological Survey (USGS) request for production data. Early in 2002, Amspec Chemical Corp., Gloucester City, NJ, a longtime producer of antimony metal and oxide, closed with no production for the year.

Secondary.—Old scrap, mostly lead battery plates, was the predominant source of U.S. secondary antimony output. New scrap, mostly in the form of drosses and residues from various sources, supplied the remainder. Antimonial lead for the manufacture of new batteries was the main market for scrap antimony.

Consumption

Consumption of primary antimony in 2002 (table 2) was slightly less than that in 2001. All categories of consumption registered only minor increases or decreases compared with 2001 (table 3). Lead-antimony alloys were used in ammunition, antifriction bearings, automotive vehicle batteries, cable sheaths, corrosion-resistant pumps and pipes, roofing 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 as well as plastics and other combustibles. Antimony was also used as a decolorizing and refining agent in some forms of glass, such as optical glass.

Of the 125 companies to which a USGS consumption survey was sent, 61 firms responded. Consumption data were estimated for the remaining 64 firms. Actual consumption may be considerably higher than estimated and reported.

Prices

In 2002, antimony prices remained steady in the first two quarters of the year but rose dramatically during the third and fourth quarters. The average New York dealer antimony metal price, published by Platts Metals Week, was \$0.63 per pound in January, rose to a peak of \$1.36 per pound in November, and finished the year at \$1.28 per pound. This price averaged \$0.88 per pound for the year 2002 compared with \$0.65 per pound in 2001. American Metal Market ceased publishing the price for other forms of antimony, such as high-tint antimony trioxide, clean antimony sulfide concentrate, and lump antimony sulfide. The marked price increase this year was attributed to the increasing effectiveness of export controls established by Chinese government officials. This had the effect of reducing a world surplus of antimony.

Trade

U.S. imports of antimony were, as is usually the case, much larger than exports—about sevenfold larger in 2002 (tables 5-8).

Imports declined by about 25%, with the category of antimony metal registering the largest decline. China remained the largest provider of all three categories—antimony metal, ore and concentrate, and antimony oxide.

Exports of antimony metal, alloys, waste, and scrap declined sharply in 2002 to a more normal level.

World Review

China.—Reports throughout 2002 indicated that in China, the world's largest antimony producer, antimony ingot output was declining and many smelters were using stockpiled concentrates. With production in the Nandan area of Guangxi Province still suspended after the July 2001 fatal accident at the Lonquam Mining Co. mine, antimony concentrate supplies have been dwindling. Most of China's antimony production remains in Hunan and Guizhou Provinces. In Guangxi Province, only large smelters, such as at Chengyuan and Longning, are still operating (American Metal Market, 2002).

In the third quarter of 2002, a Chinese government official confirmed substantial antimony production cutbacks for the year. He stated that China's total antimony concentrate output for the first 8 months of 2002 was 35,000 t, down by 42% from 60,000 t in the comparable period of 2001. The Hunan, Guangxi, and Yunnan mines accounted for 64%, 27%, and 4%, respectively, of China's total antimony concentrate production (Platts Metals Week, 2002a).

The Hsikwangshan Mining Administration partially restarted its southern antimony mine, which had been closed since major flooding struck Hunan Province. However, production at the mine (near Lengshuijiang) was only at 40% to 50% of capacity (Metal Bulletin, 2002).

China's State Economic and Trade Commission (SETC) announced that it will actively guide reforms within the country's nonferrous metal industry and assist companies attempting to cope with problems emerging in their business operations. The SETC pledged to increase the macro control of the mining, separating, smelting, importing, and exporting of China's scarce nonferrous metal ores and to formulate a comprehensive development program for the country's strategic minerals including: antimony, molybdenum, niobium, tantalum, and tungsten. Also, the organization indicated that it will pay specific attention to the border trade and smuggling that damages the industry (Metal-Pages, 2003a§¹).

China's Ministry of Foreign Trade and Economic Cooperation announced that the 2003 quota for exports of antimony ingot and other antimony semiproducts will be 67,000 t, about 4% lower than in 2002 (Metal-Pages 2002§).

Commonwealth of Independent States.—Production of antimony at the Kadamzhay Antimony Combine smelter in Kyrgyzstan fell dramatically in 2002. In the first 11 months of 2002, Kadamzhay produced 1,300 t of antimony, a decline of 40% from the comparable period of 2001 and significantly below the 3,000 t target set at the start of 2002. Reportedly, the Combine has been unable to source antimony feedstock and is relying on low-grade and recycled material. Kadamzhay is the

only antimony smelter in the Commonwealth of Independent States and has relied on feed from the antimony mines in Russia's Sakha (Yakutiya) Republic, Anzobsky mining and beneficiation complex in Tajikistan, and Ust-Kamenogorsk Titanium-Magnesium Combine in Kazakhstan.

Mines in Russia's Sakha (Yakutiya) Republic have produced a gold-antimony concentrate, but these mines were believed to be temporarily closed. Anzobsky GOK in Tajikistan has been the main source of antimony concentrates for Kadamzhay in recent years. It produces a concentrate containing both antimony and mercury. This material is difficult to treat and is first processed by Khaydarken Mercury Combine in Kyrgyzstan for removal of the mercury before being delivered to Kadamzhay for antimony processing. Kazakh producer Ust-Kamenogorsk produces an antimony-containing bullion as a byproduct of other metals production, but Khaydarken Combine has recently begun exporting its material for processing to China (Metal-Pages, 2003b§).

South Africa.—Metorex Mining Group increased antimony production at its Consolidated Murchison antimony mine to take advantage of rising prices (Platts Metals Week, 2002b).

Outlook

Although domestic antimony consumption experienced a slight decline in 2002, demand is likely to remain firm in the near term. If the stronger prices of 2002 are maintained, there is at least the possibility that some closed mines will reopen. At its rate of sales in 2002, the DLA anticipated depleting its antimony stockpile in 2003.

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GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

- Antimony. Ch. in United States Mineral Resources, Professional Paper 820, 1973.
- Antimony. Mineral Industry Surveys, quarterly.

¹References that include a section mark (§) are found in the Internet References Cited section.

Other

Antimony. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985. Engineering and Mining Journal.

TABLE 1
SALIENT ANTIMONY STATISTICS¹
(Metric tons of antimony content unless otherwise specified)

	1998	1999	2000	2001	2002
United States:					
Production:					
Primary:					
Mine, recoverable antimony	489 ²	450 ²	W	--	--
Smelter	15,500 ^r	15,300 ^r	13,300 ^r	9,080 ^r	W
Secondary	7,710	8,220	7,700 ^r	5,380 ^r	5,350
Exports of metal, alloys, waste and scrap, gross weight	898	473	1,080	1,730	992
Exports of antimony oxide ³	3,270	3,190	6,040	5,880	3,260
Imports for consumption	34,600	36,800	41,600	37,900	28,500
Reported industrial consumption, primary antimony	12,700	13,500	16,400	13,100 ^r	12,900
Stocks, primary antimony, all classes, December 31	10,600	10,900	6,780	4,990 ^r	5,490
Price, average, cents per pound ⁴	71.8	62.7	65.5	64.7	88.4
World, mine production	116,000	107,000	125,000 ^r	167,000 ^r	143,000 ^e

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

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

²Data from 10-K reports.

³Antimony content is calculated by the U.S. Geological Survey.

⁴New York dealer price for 99.5% to 99.6% metal, cost, insurance, and freight U.S. ports.

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

(Metric tons of antimony content)

Year	Class of material consumed			Total
	Metal	Oxide	Other ²	
2001 ^r	1,620	11,400	79	13,100
2002	1,780	11,000	85	12,900

^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	2001	2002
Metal products:		
Antimonial lead	1,060 ^r	887
Bearing metal and bearings	52	42
Solder	78	89
Other ²	1,610 ^r	1,750
Total	2,800 ^r	2,760
Nonmetal products:		
Ammunition primers	W	W
Ceramics and glass	518 ^r	505
Pigments	653	565
Plastics	1,050	1,090
Other ³	544	548
Total	2,760 ^r	2,710
Flame-retardants:		
Adhesives	W	W
Plastics	6,210	6,060
Rubber	242	251
Textiles	255	269
Other ⁴	872 ^r	840
Total	7,570 ^r	7,420
Grand total	13,100 ^r	12,900

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

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 was 6,480 metric tons (t) in 2001 and 6,475 t in 2002.

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

(Metric tons of antimony content)

Type of material	2001 ^r	2002
Metal	645	729
Oxide	4,090	4,510
Other ²	256	253
Total	4,990	5,490

^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	2001		2002	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Canada	155	\$279	369	\$842
Colombia	--	--	5	9
El Salvador	--	--	29	55
Germany	(²)	97	70	692
Japan	--	--	2	17
Mexico	1,540	2,400	512	761
Switzerland	6	78	4	59
Other	27	226 ^r	1	68
Total	1,730	3,080	992	2,500

^rRevised. -- Zero.

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

²Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 6
U.S. EXPORTS OF ANTIMONY OXIDE, BY COUNTRY¹

Country	2001			2002		
	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)
Argentina	83	69	\$272	57	47	\$269
Australia	72	60	145	57	47	137
Belgium	19	16	26	51	42	99
Brazil	277	230	727	37	31	113
Canada	1,380	1,140	3,240	1,530	1,270	3,890
China	11	9	112	25	21	84
Colombia	67	56	133	58	48	133
France	28	23	76	66	55	199
Germany	68	56	178	23	19	43
Indonesia	6	5	13	--	--	--
Italy	5	4	20	8	7	32
Japan	41	34	214	37	31	177
Korea, Republic of	15	12	38	11	9	56
Mexico	4,360	3,620	6,930	1,350	1,120	3,280
Singapore	74	61	225	33	27	313
Spain	56	46	237	49	41	242
Taiwan	20	17	53	15	12	61
Turkey	83	69	239	73	61	244
United Kingdom	194	161	700	170	141	716
Other	242	199	715	283	234	852
Total	7,090	5,880	14,300	3,930	3,260	10,900

-- 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.

Source: U.S. Census Bureau.

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

Country	2001			2002		
	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:						
Australia	474	314	\$217	--	--	--
Austria	368	259	1,210	459	477	\$1,700
China	1,540	1,530	1,920	723	715	1,000
Germany	17	12	52	38	26	104
Mexico	--	--	--	42	37	105
South Africa	208	173	44	--	--	--
Yugoslavia	--	--	--	57	56	144
Total	2,610	2,290	3,440	1,320	1,310	3,050
Antimony oxide:						
Belgium	3,770	3,130	6,450	3,680	3,060	6,660
Bolivia ³	40	33	49	--	--	--
Canada	20	17	28	--	--	--
China	11,000	9,150	14,600	10,200	8,430	18,700
France	14	11	61	12	10	50
Germany	24	20	362	22	19	272
Hong Kong	790	656	966	962	798	1,510
Italy	--	--	--	4	3	17
Japan	69	57	429	140	116	505
Mexico	8,080	6,710	15,600	9,770	8,110	15,500
South Africa	3,750	3,110	900	3,160	2,620	3,350
Switzerland	40	33	37	--	--	--
Taiwan	41	34	63	18	15	33
United Kingdom	-- ^r	-- ^r	-- ^r	18	15	45
Total	27,700	23,000	39,500	27,900	23,200	46,700

^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.

³Antimony oxide from this country believed to be "crude" and would probably be shipped to refineries for upgrading.

Source: U.S. Census Bureau.

TABLE 8
U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY METAL, BY COUNTRY¹

Country	2001		2002	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Bolivia	39	\$41	81	\$160
Canada	69	253	54	382
China	9,730	11,600	2,590	4,130
Germany	(2)	40	(2)	51
Hong Kong	1,780	2,390	92	164
Japan	15	486	3	139
Kyrgyzstan	41	58	--	--
Mexico	667	447	880	653
Peru	123	123	285	942
United Kingdom	(2)	38	(2)	143
Other	149	181	59	104
Total	12,600	15,700	4,050	6,870

-- Zero.

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

²Less than 1/2 unit.

Source: U.S. Census Bureau.

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

(Metric tons)

Country	1998	1999	2000	2001	2002 ^e
Australia ³	1,800	1,679	1,511	1,380 ^r	1,200
Bolivia	4,735	2,790	1,907	2,264 ^r	2,200
Canada ⁴	428	357	364	234 ^r	143 ⁵
China ^e	97,400	89,600	110,000 ^r	150,000 ^r	130,000
Guatemala	400	--	--	-- ^e	--
Kyrgyzstan ^e	150	100	150	150	150
Mexico ⁶	338	126	39	-- ^r	--
Morocco ^{e,4}	160	250	--	--	--
Peru, refined	364	255	461	274 ^r	300
Russia, recoverable ^e	4,000	4,000	4,500	4,500	NA ⁷
South Africa ⁴	4,243	5,278	4,104	4,827 ^r	5,800
Tajikistan ^e	1,500	1,800	2,000	2,500	3,000
Thailand, content of ore and concentrate	199	59	84	18 ^r	24
Turkey ^e	30	180	360	370 ^r	370
United States	489	450	W	--	--
Total	116,000	107,000	125,000 ^r	167,000 ^r	143,000

^eEstimated. ^rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data; not included in "Total." -- Zero.

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

²Antimony content of ore unless otherwise indicated. Table includes data available through May 27, 2003.

³Antimony content of antimony ore and concentrate, lead concentrates, and lead-zinc concentrates.

⁴Antimony content of concentrate.

⁵Reported figure.

⁶Previously published data for Mexico included antimony mined in other countries and smelted in Mexico. That prior data was, in metric tons, as follows: 1998--1,301; 1999--273; 2000--52; 2001--81 (revised) (estimated); 2002--80 (estimated).

⁷Reports indicate that Russian antimony production was sharply curtailed.