

ANTIMONY

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One-half of the primary antimony used in the United States in 1999 went into flame-retardants; the rest was used by the transportation, chemical, ceramics, and glass industries, and in other applications. Secondary antimony, which was derived almost entirely from recycled lead-acid batteries, was used in the manufacture of new batteries. The price of antimony metal, on average, was 13% lower than that of 1998, continuing a pattern of steadily lower prices in each of the past 4 years. World production remained at a much lower level, as in 1998, compared to recent prior years, reflecting a concerted effort by major producers to cut back output in light of lower prices.

A small amount of antimony was recovered as a byproduct of the mining of silver-copper ores at one mine in Idaho, but almost all primary antimony metal and oxide produced domestically originated from raw material imports. Primary smelter production declined slightly in 1999. Most domestic smelting consisted of upgrading imported antimony trioxide to a higher purity. Primary antimony metal and oxide valued at \$44 million were produced by four companies operating four plants—two in Texas and one each in Montana and New Jersey. 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 5 or 10 years ago because of changing materials requirements for batteries. Industry stocks remained steady (table 4).

Antimony was mined as a principal product and was a byproduct of the smelting of base metal ores in 15 countries. Ninety-four percent of world primary antimony was mined in China (82%), South Africa (5%), Bolivia (4%), and Russia (3%) (table 9). World antimony reserves at yearend 1999 were estimated to be 2.1 million metric tons (Carlin, 2000).

Legislation and Government Programs

Sales of antimony from the National Defense Stockpile (NDS) proceeded for the seventh consecutive year. Sales were conducted on a negotiated bid basis and were held by Defense National Stockpile Center (DNSC) on the third Monday of every 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 ingots and grade B ingots, cake and broken pieces. The antimony sulfide ore has been depleted. In calendar year 1999, 5,793 metric tons (t) of antimony was sold. At yearend 1999, the antimony inventory in the DNSC was 11,641 t. Antimony was stockpiled in Government warehouses

in eight depots with Somerville, NJ, holding the largest amount (Defense Logistics Agency, 1999).

Production

Mine.—In the Coeur d'Alene District of Idaho, Sunshine Mining Co., the sole domestic mine producer, recovered antimony-in-concentrate as a byproduct of the treatment of complex silver-copper-antimony sulfide ore. The company responded to the U.S. Geological Survey (USGS) voluntary canvass report.

Smelter.—The domestic producers of primary antimony metal and oxide products were Amspec Chemical Corp., Gloucester City, NJ; Anzon Inc., Laredo, TX; Laurel Industries Inc., La Porte, TX; and U.S. Antimony Corp., Thompson Falls, MT. All replied to the USGS request for production data.

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

Consumption

Reported consumption of primary antimony was slightly above that of 1998 (tables 2 and 3). Virtually all user categories remained steady. Lead-antimony alloys were used in automotive vehicle batteries, ammunition, corrosion-resistant pumps and pipes, tank linings, roofing sheets, solder, cable sheaths, and antifriction bearings. Antimony trioxide, often dissolved in an organic solvent, was used to enhance the flame-retardant properties of plastics, textiles, and other combustibles. Antimony was used as a decolorizing and refining agent in some forms of glass, such as optical glass.

Of the 138 companies to which a voluntary USGS canvass form was sent, 120 firms responded; consumption data were estimated for 18 firms.

Prices

In 1999, antimony prices generally declined a bit, continuing the downward drift that had started in 1995, declining from the peak price that had been established in late 1994. The New York dealer's antimony metal price, published by Platt's Metals Week, started the year at \$0.67 to \$0.77 per pound and finished the year at \$0.63 to \$0.70 per pound. This price had averaged \$0.63 per pound for the year compared with \$0.72 per pound in 1998. The price range for high-tint antimony trioxide,

published by American Metal Market, was \$0.90 to \$1.05 per pound at the start of the year and remained at that level the entire year.

Foreign Trade

Imports of antimony were, as is usually the case, much larger than exports—about tenfold larger in 1999 (tables 5-8). Import levels for the various forms of antimony remained fairly steady. Mexico became the largest supplier of antimony ore and concentrate, accounting for 45% of the total. China remained the dominant provider of antimony metal and antimony oxide, supplying 89% of the former, and 41% of the latter.

World Review

Bolivia.—Empresa Minera Unificada (EMUSA), Bolivia's largest antimony producer, formally issued notice of layoff to over 200 of its core workforce at the Chilcobija antimony mine. The mine had been on care and maintenance since the start of the year and ore stockpiles have been used to meet its contractual commitments. A toll contract with the Vinto antimony smelter ran until late 1999, whereby EMUSA supplied Laurel Industries Co. (USA) with antimony trioxide (Metal Bulletin, 1999).

China.—Reports indicated that the Government stopped the issuance of new mining licenses for antimony, tin, and tungsten from June 1, 1999, until the end of the year 2000. This move was believed to be a measure intended to limit excess production of these metals (Ryan's Notes, 1999).

During the third quarter, the Chinese Antimony Producers Association met in Haikou, Hainan Province, to discuss the oversupply of antimony in the Chinese and global markets. A consensus was reached that total domestic antimony output should be 60,000 tons per year. The China Nonferrous Metals Industry Import and Export Corp. set a priority to purchase stockpiles from those antimony producers that supported restricted production.

The Xikuangshan Mining Bureau shut down its two mines and three smelters in the third quarter. Xikuangshan had produced 20,000 tons per year, of which 95% was exported. In recent years, owing to low antimony market prices, production costs exceeded selling prices, resulting in financial difficulties for the company. Over 3,700 employees were laid off and 3,600 more workers were idled for 3 months (Mining Journal, 1999).

Guatemala.—One of the most important antimony producers in Central America and South America has long been Minas de Guatemala, S.A., a privately held company formed in 1969. The company is a producer of antimony products as well as a mine owner and operator. Facilities include: six mines located in northwest Guatemala; a 250-ton-per-day gravity and flotation mill; and a smelting-refining-oxidizing plant. The mines are operated by sinking vertical shafts down to 100 to 150 meters and driving tunnels to the ore zones. The mill

produces antimony flotation concentrate. These concentrates are processed in the company's metallurgical facility to produce antimony metal and antimony trioxide. Over the firm's 30-year history, employment had averaged 600 workers, with the peak being 800 plus people; due to depressed antimony prices, however, employment was 120 people by late 1999. Output is sold to Europe, Japan, and the United States (Abularach, Minas de Guatemala, S.A., written commun., January 12, 2000).

Outlook

In 1999, reported domestic antimony demand remained in essentially the same narrow band as it has for five or more years. While the average antimony price in 1999 declined 13% from that of 1998, that decline was substantially less than those recorded in each of the prior 3 years. Domestic antimony consumption, especially in such important segments as flame retardants, is likely to remain strong for the near future.

A few new antimony mines have been developed in recent years, in Canada, for example, but continuing low antimony prices will probably prevent them from coming fully on-stream any time soon. The NDS will be selling antimony for some years, thus providing a small but readily available part of domestic supply.

References Cited

- Carlin, Jr. J.F., 2000, Antimony: U.S. Geological Survey Mineral Commodity Summaries 2000, p. 24-25.
Defense Logistics Agency, 1999, Inventory of stockpile material: Fort Belvoir, VA, Defense Logistics Agency monthly release, December 31, p. 1.
Metal Bulletin, 1999, EMUSA lays off Chilcobija workers: Metal Bulletin, no. 8390, July 5, p. 9.
Mining Journal, 1999, China-tin: Mining Journal Annual Review, p. 155-156.
Ryan's Notes, 1999, Selenium tightness bulls prices: Ryan's Notes, v. 5, no. 24, p. 4.

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

- Antimony. Ch. in Minerals Commodity Summaries.¹
Antimony. Ch. in Minerals Yearbook, annual.¹
Antimony. Ch. in United States Mineral Resources, Professional Paper 820, 1973.
Antimony. Mineral Industry Surveys, quarterly.¹

Other

- American Metal Market, daily.
Antimony. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.
Engineering and Mining Journal.
Metal Bulletin [London].
Platt's Metals Week.

¹Prior to January 1996, published by the U.S. Bureau of Mines.

TABLE 1
SALIENT ANTIMONY STATISTICS 1/

(Metric tons of antimony content unless otherwise specified)

	1995	1996	1997	1998	1999
United States:					
Production					
Primary:					
Mine (recoverable antimony) 2/	262	242	356	498 r/	449
Smelter	23,500	25,600	26,400	24,000	23,800
Secondary 3/	10,500	7,780	7,550	7,710	8,220
Exports of metal, alloys, waste and scrap (gross weight)	1,610	462	652	898	473
Exports of antimony oxide 4/	6,590	3,990	3,230	3,270	3,190
Imports for consumption	36,600	37,600	39,300	34,600	36,800
Reported industrial consumption, primary antimony	14,300	13,600	13,500	12,700 r/	12,800
Stocks: Primary antimony, all classes, December 31	10,600	11,000	10,800	10,600 r/	10,700
Price: Average, cents per pound 5/	227.8	146.5	97.8	71.8	62.7
World: Mine production	151,000	155,000	155,000	117,000 r/	122,000 e/

e/ Estimated. r/ Revised.

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

2/ Data from 10-K reports.

3/ A review of secondary lead smelting, the source of nearly all secondary antimony, showed that recovery of secondary antimony had been markedly overstated in the 1995 and earlier annual reviews.

4/ Antimony content is calculated by the U.S. Geological Survey.

5/ New York dealer price for 99.5% to 99.6% metal, c.i.f. U.S. ports.

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

(Metric tons of antimony content)

Year	Class of material consumed			Total
	Metal	Oxide	Other 2/	
1998	1,870	10,700 r/	139	12,700 r/
1999	1,570	11,000	178	12,800

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	1998	1999
Metal products:		
Antimonial lead	1,710 r/	1,760
Bearing metal and bearings	33	32
Solder	153	135
Other 2/	687 r/	513
Total	2,580	2,440
Nonmetal products:		
Ammunition primers	17	23
Ceramics and glass	1,110 r/	1,120
Pigments	1,130 r/	1,020
Plastics	1,460 r/	1,580
Other 3/	192 r/	198
Total	3,910 r/	3,940
Flame-retardants:		
Adhesives	138	140
Plastics	5,460 r/	5,640
Rubber	334	391
Textiles	239	229
Other 4/	17	14
Total	6,190 r/	6,410
Grand total	12,700 r/	12,800

r/ Revised.

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.

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

(Metric tons of antimony content)

Type of material	1998	1999
Metal	2,920	2,430
Oxide	4,610 r/	5,550
Other 2/	3,060	2,720
Total	10,600 r/	10,700

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/

Country	1998		1999	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Belgium	86	\$78	--	--
Brazil	5	9	9	\$16
Canada	125	309	153	302
Chile	14	35	--	--
Colombia	5	10	--	--
El Salvador	20	36	20	34
Greece	20	26	--	--
Hong Kong	36	84	--	--
Japan	53	499	24	235
Mexico	231	737	230	508
Switzerland	1	20	6	45
Taiwan	245	339	--	--
Thailand	--	--	24	494
United Arab Emirates	54	61	--	--
Other	2 r/	156 r/	6	176
Total	898	2,400	473	1,810

r/ Revised. -- Zero.

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

Source: Bureau of the Census.

TABLE 6
U.S. EXPORTS OF ANTIMONY OXIDE, BY COUNTRY 1/

Country	1998			1999		
	Gross weight (metric tons)	Antimony content 2/ (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content 2/ (metric tons)	Value (thousands)
Argentina	72	60	\$230	94	78	\$293
Australia	124	103	294	196	163	463
Belgium	57	47	216	1	1	5
Brazil	34	28	122	19	16	73
Canada	1,360	1,130	3,790	1,420	1,180	3,280
China	144	120	332	376	312	1,140
Colombia	99	82	262	174	144	389
France	--	--	--	57	47	158
Germany	114	95	395	119	99	420
Indonesia	5	4	22	36	30	91
Italy	12	10	64	1	1	6
Japan	489	406	1,040	90	75	216
Korea, Republic of	6	5	32	27	22	138
Mexico	683	567	2060	688	571	1670
Singapore	263	218	580	75	62	176
Spain	21	17	133	78	65	274
Taiwan	120	100	470	23	19	69
Turkey	14	12	39	47	39	146
United Kingdom	214	178	632	218	181	703
Other	103	85	400	107	88	325
Total	3,930	3,270	11,100	3,840	3,190	10,000

-- 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: Bureau of the Census.

TABLE 7
U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY, BY CLASS AND COUNTRY 1/

Country	1998			1999		
	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	862	572	\$716	1,660	1,070	\$710
Austria	212	149	567	95	66	307
Canada	137	90	121	--	--	--
China	1,180	1,020	1,550	436	398	508
Hong Kong	--	--	--	59	53	52
Indonesia	72	50	33	--	--	--
Kyrgyzstan	40	40	72	--	--	--
Mexico	42	42	74	1,340	1,290	1,770
United Kingdom	96	61	80	--	--	--
Total	2,640	2,020	3,210	3,590	2,870	3,350
Antimony oxide:						
Belgium	2,190	1,820	5,470	3,290	2,730	5,890
Bolivia 3/	3,160	2,620	5,000	1,770	1,470	2,110
Chile 3/	218	181	343	275	229	328
China	10,100	8,370	14,700	9,470	7,860	11,800
France	221	183	570	233	193	329
Guatemala 3/	320	266	785	249	207	428
Hong Kong	507	420	1,040	420	349	523
Mexico 3/	2,880	2,390	5,050	3,560	2,950	4,710
Netherlands	200	166	296	178	148	193
Russia	300	249	377	--	--	--
South Africa	2,690	2,240	695	3,220	2,680	938
United Kingdom	93	77	269	244	202	699
Other	164 r/	137	939	143	119	977
Total	23,000	19,100	35,500	23,100	19,100	28,900

r/ Revised. -- 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 Bureau of the Census. Antimony oxide content is calculated by the U.S. Geological Survey.

3/ Antimony oxide from these countries believed to be "crude" and would probably be shipped to refineries for upgrading.

Source: Bureau of the Census.

TABLE 8
U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY METAL, BY COUNTRY 1/

Country	1998		1999	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Canada	225	\$417	58	\$303
China	11,700	16,700	13,100	15,800
Hong Kong	316	437	267	270
Japan	6	221	10	481
Mexico	942	655	736	524
Peru	157	192	209	219
Singapore	(2/)	(2/)	400	439
Taiwan	63	105	(2/)	11
United Kingdom	20	100	(2/)	204
Other	40 r/	98 r/	9	177
Total	13,500	18,900	14,800	18,500

r/ Revised.

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

2/ Less than 1/2 unit.

Source: Bureau of the Census.

TABLE 9
ANTIMONY: WORLD MINE PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1995	1996	1997	1998	1999 e/
Australia 3/	900	1,800	1,900	1,800 r/	1,800
Bolivia	6,426	6,488	5,999	4,735 r/	4,800
Canada 4/	684	1,716	529	428 r/	566 p/
China e/	125,000	129,000	131,000	97,400 r/	100,000
Guatemala	665	880	880	440 r/	440
Kyrgyzstan e/	1,500	1,200	1,200 5/	150 r/	100
Mexico 6/	1,783	983	1,909	1,301	1,500
Morocco 4/	198	152	160	160 r/	150
Namibia (Sb content of sodium antimonate)	--	8	--	--	--
Pakistan e/	6 5/	--	--	--	--
Peru (recoverable) e/	460	460	460	460	460
Russia (recoverable) e/	6,000	6,000	6,000	4,000	4,000
South Africa 4/	5,537	5,137	3,415	4,243 r/	6,000
Tajikistan e/	1,000	1,000	1,200 5/	1,500 r/	1,800
Thailand (content of ore and concentrate) e/	230	70	60	200 r/	190
Turkey	416	285	31 r/	30 r/ e/	30
United States	262	242	356	498 r/	449 5/
Zimbabwe 4/	37	5 e/	-- r/	-- r/	--
Total	151,000	155,000	155,000	117,000 r/	122,000

e/ Estimated. p/ Preliminary. r/ Revised. -- Zero.

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

2/ Antimony content of ore unless otherwise indicated. Table includes data available through June 9, 2000.

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

4/ Antimony content of concentrate.

5/ Reported figure.

6/ Antimony content of ores for export plus antimony content of antimonial lead and other smelter products produced.