

ANTIMONY

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Almost one-half of the primary antimony used in the United States in 1998 went into flame-retardants; the rest was used by the transportation, chemical, and ceramics and glass industries and in other applications. Secondary antimony, which was derived almost entirely from recycled lead-acid batteries, was used at the recovery plants to make new batteries. The price of antimony metal, on average, was one-fourth lower than that of 1997, continuing a pattern of markedly lower prices in each of the past 3 years.

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 imports. Primary smelter production declined by 9% in 1998. Most domestic smelting consisted of upgrading imported antimony trioxide to a higher purity. Primary antimony metal and oxide valued at \$50 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 has been declining in recent years 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-five percent of world primary antimony was mined in China (86%), Bolivia (4%), Russia (3%), and South Africa (2%) (table 9). World antimony reserves at yearend 1998 were estimated to be 2.1 million metric tons (Carlin, 1999).

Legislation and Government Programs

Sales of antimony from the National Defense Stockpile (NDS) proceeded for the sixth consecutive year. Sales were conducted on a negotiated bid basis and were held by the Defense Logistics Agency on the fourth Tuesday of every month. There was no maximum limit to the quantity a company could bid on, but there was a minimum of 5 metric tons (11,000 pounds) for ingots, cakes (Grade B), and broken pieces (Grade A). The material offered was Grade A and B ingots or cakes, as well as broken pieces of Grade A material and antimony sulfide ore. In calendar year 1998, 4,155 tons of contained antimony was sold. At yearend 1998, the antimony inventory in the NDS was 15,582 tons. Antimony was stockpiled in Government warehouses in 12 depots, with the Somerville, NJ, depot holding the largest amount (Defense Logistics Agency, 1998).

Production

Mine Production.—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 request.

Smelter Production.—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 Production.—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 below that of 1997 (tables 2 and 3). Among the larger use categories, consumption for ceramics and glass and for plastics declined significantly. 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 141 companies to which a voluntary USGS canvass form was sent, 131 firms responded; consumption data were estimated for 10 firms.

Prices

In 1998, antimony prices generally continued the downward drift that had started in 1995, declining from the peak price established in late 1994 (table 1). The decline in 1998, however, was much more moderate than the sharp declines of 1995, 1996, and 1997. The New York dealer's antimony metal price, published by Platt's Metals Week, started the year at \$0.75 to \$0.85 per pound and finished the year at \$0.67 to \$0.77 per

pound. This price had averaged \$0.72 per pound for the year compared with \$0.98 per pound in 1997. The price range for high-tint antimony trioxide, published by American Metal Market, was \$1.05 to \$1.15 per pound at the beginning of the year and was \$0.90 to \$1.05 per pound at the end of the year.

Foreign Trade

Imports of antimony were, as is usually the case, much larger than exports—about ten-fold larger in 1998 (tables 5-8). Total imports declined by 12%, and antimony metal imports declined by 9%. China continued to be the dominant supplier to the United States, accounting for 87% of antimony metal imports and 44% of antimony oxide imports.

World Review

Bolivia.—The Chilcobija antimony mine, owned by Empresa Minera Unificada Sociedad Anónima (EMUSA), the country's largest antimony producer, was put under care and maintenance owing to the steep decline in antimony prices in recent years. The mine had a capacity of 12,000 tons per year of antimony-in-concentrate, but had not operated at that level of production for several years. In recent years, it has typically produced 4,000 to 5,000 tons per year of antimony-in-concentrate. Chilcobija, located in Potosi Department, was the largest and longest operating antimony mine in Bolivia. It was the last antimony mine operated by EMUSA following the closure of two other smaller mines. The closure of Chilcobija brings doubts as to the future of the Empresa Nacional de Fundiciones (ENAF) antimony smelter in Bolivia. ENAF was the smelter subsidiary of Corporación Minera de Bolivia, the Government-owned mining company. Most of the smelter's feedstock had been supplied by Chilcobija. Local observers speculate that to remain operating, the smelter will need to develop other domestic or, more likely, foreign feed sources. EMUSA, a company with a wide variety of other mining assets, had been subsidizing Chilcobija since the antimony price began slipping a few years ago (Metal Bulletin, 1999).

Canada.—Roycefield Resources Ltd., which was poised to begin antimony-in-concentrate production at its new Beaver Brook operation in Gander, Newfoundland, in late 1997, announced in early 1998 that it had suspended the start of mining because of low antimony prices. The company continued testing at its antimony trioxide demonstration plant. This plant will use a newly developed hydrometallurgical process to produce antimony trioxide. Roycefield has been using its 5,000-ton stockpile of antimony concentrate for test feed. A full-scale commercial trioxide plant would not be constructed until market conditions improve (Mining Journal, 1998).

China.—Hunan Donggang Antimony Co. planned to produce 3,000 to 4,000 tons of antimony in 1998. That figure

was substantially below its capacity of 4,800 tons yearly but above its 1997 output of about 3,000 tons.

Russia.—The country's largest tin smelter, the Novosibirsk tin works, announced plans to start recovery of antimony and bismuth from secondary materials, most of which were being imported in 1998 (Metal Bulletin, 1998).

Outlook

In 1998, reported domestic antimony demand softened slightly for the fourth consecutive year. The marginally lesser consumption in the United States was reflected somewhat in a continuing decline in world prices. Although consumption of primary antimony metal for flame retardants declined, use in this dominant market is likely to remain strong for several years.

Several new antimony mines have been developed in recent years, in Canada, for example, but continuing low antimony prices may 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.

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SOURCES OF INFORMATION

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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)

	1994	1995	1996	1997	1998
United States:					
Production					
Primary:					
Mine (recoverable antimony) 2/	215	262	242	356	242
Smelter	25,500	23,500	25,600	26,400 r/	24,000
Secondary 3/	12,200	10,500	7,780	7,550	7,710
Exports of metal, alloys, waste and scrap (gross weight)	1,350	1,610	462	652	898
Exports of antimony oxide 4/	6,500	6,590	3,990	3,230	3,270
Imports for consumption	41,500	36,600	37,600	39,300	34,600
Reported industrial consumption, primary antimony	14,800	14,300	13,600	13,500	13,300
Stocks: Primary antimony, all classes, December 31	10,900	10,600	11,000	10,800 r/	10,600
Price: Average, cents per pound 5/	177.7	227.8	146.5	97.8	71.8
World: Mine production	118,000	151,000	155,000 r/	155,000 r/	140,000 e/

e/ Estimated. r/ Revised.

1/ Data are rounded to 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 1994 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 1/

(Metric tons of antimony content)

Year	Class of material consumed			Total
	Metal	Oxide	Other 2/	
1997	2,060	11,300	131	13,500
1998	1,870	11,300	139	13,300

1/ Data are rounded to 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	1997	1998
Metal products:		
Antimonial lead	1,180 r/	1,130
Bearing metal and bearings	45	33
Solder	226	153
Other 2/	1,150	1,260
Total	2,600	2,580
Nonmetal products:		
Ammunition primers	20	17
Ceramics and glass	1,080	1,660
Pigments	824	881
Plastics	1,230 r/	1,590
Other 3/	159	318
Total	3,310 r/	4,460
Flame-retardants:		
Adhesives	344	138
Plastics	6,610	5,490
Rubber	351 r/	334
Textiles	247	239
Other 4/	7	17
Total	7,560 r/	6,220
Grand total	13,500	13,300

r/ Revised.

1/ Data are rounded to 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	1997	1998
Metal	3,070	2,920
Oxide	4,530 r/	4,570
Other 2/	3,240	3,060
Total	10,800 r/	10,600

r/ Revised.

1/ Data are rounded to 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	1997		1998	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Belgium	82	\$135	86	\$78
Canada	231	525	125	309
Hong Kong	10	115	36	84
Japan	3	13	53	499
Mexico	267	920	231	737
Netherlands	17	83	2	75
Taiwan	(2/)	5	245	339
United Arab Emirates	--	--	54	61
Other	41 r/	485 r/	66	217
Total	652	2,280	898	2,400

r/ Revised.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Less than 1/2 unit.

Source: Bureau of the Census.

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

Country	1997			1998		
	Gross weight (metric tons)	Antimony content 2/ (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content 2/ (metric tons)	Value (thousands)
Argentina	31	26	\$76	72	60	\$230
Australia	59	49	182	124	103	294
Belgium	39	32	221	57	47	216
Brazil	26	22	161	34	28	122
Canada	1,180	978	4,340	1,360	1,130	3,790
China	8	7	33	144	120	332
Colombia	83	69	230	99	82	262
Germany	44	37	146	114	95	395
Indonesia	6	5	33	5	4	22
Italy	51	42	169	12	10	64
Japan	717	595	1,910	489	406	1,040
Korea, Republic of	58	48	292	6	5	32
Mexico	306	254	1,670	683	567	2,060
Netherlands	20	17	119	3	2	7
Singapore	623	517	1,700	263	218	580
Spain	60	50	397	21	17	133
Taiwan	227	188	671	120	100	470
Turkey	67	56	361	14	12	39
United Kingdom	65	54	526	214	178	632
Other	227 r/	187 r/	779 r/	103	85	400
Total	3,900	3,230	14,000	3,930	3,270	11,100

r/ Revised.

1/ Data are rounded to 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	1997			1998		
	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	92	75	\$95	862	572	\$716
Austria	245	170	727	212	149	567
Bolivia	21	17	15	--	--	--
Canada	195	117	266	137	90	121
Chile	80	66	97	--	--	--
China	819	778	1,500	1,180	1,020	1,550
Other	80	71	94	249	192	259
Total	1,530	1,300	2,800	2,640	2,020	3,210
Antimony oxide:						
Belgium	2,170	1,800	6,950	2,190	1,820	5,470
Bolivia 3/	3,260	2,700	7,200	3,160	2,620	5,000
Chile 3/	130	108	269	218	181	343
China	12,600	10,400	25,700	10,100	8,370	14,700
France	262	218	755	221	183	570
Guatemala 3/	1,060	880	2,450	320	266	785
Hong Kong	295	245	707	507	420	1,040
Kyrgyzstan	663	550	1,290	--	--	--
Mexico 3/	3,440	2,860	6,330	2,880	2,390	5,050
Netherlands	179	148	294	200	166	296
Russia	376	312	639	300	249	377
South Africa	3,130	2,600	860	2,690	2,240	695
United Kingdom	173	144	612	93	77	269
Other	197	165	1,150	163	137	939
Total	27,900	23,200	55,200	23,000	19,100	35,500

1/ Data are rounded to 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	1997		1998	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Bolivia	22	\$37	--	--
Canada	48	313	225	\$417
Chile	20	33	--	--
China	12,900	25,100	11,700	16,700
Hong Kong	620	1,120	316	437
Japan	23	1,000	6	221
Kyrgyzstan	177	420	--	--
Mexico	755	579	942	655
Peru	181	899	157	192
Thailand	20	46	--	--
United Kingdom	20	257	20	100
Other	78 r/	482 r/	103	203
Total	14,800	30,300	13,500	18,900

r/ Revised.

1/ Data are rounded to three significant digits; may not add to totals shown.

Source: Bureau of the Census.

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

(Metric tons)

Country	1994	1995	1996	1997	1998 e/
Australia 3/	1,300	900	1,800	1,900	1,300
Bolivia	7,050	6,426	6,488 r/	5,999 r/	6,000
Canada 4/	643	684	1,716	529 r/	554
China e/	91,000	125,000	129,000	131,000 r/	120,000
Guatemala	296	665	880	880	880 5/
Kyrgyzstan e/	2,000	1,500	1,200	1,200 5/	100
Mexico 6/	1,758	1,783	983	1,909 5/	1,301 5/
Morocco 4/	175	198	152	160	--
Namibia (Sb content of sodium antimonate)	14	--	8	-- r/	--
Pakistan e/	--	6 5/	--	--	--
Peru (recoverable) e/	460	460	460	460	460
Russia (recoverable) e/	7,000 5/	6,000	6,000	6,000	4,000
South Africa 4/	4,534	5,537	5,137	3,415 r/	3,500
Tajikistan e/	1,000	1,000	1,000	1,200 5/	1,200
Thailand (content of ore and concentrate) e/	500	230	70	60	55
Turkey	75	416	285 r/	250 r/ e/	250
United States	215	262	242	356	242 5/
Zimbabwe 4/	65	37	5 e/	5	5
Total	118,000	151,000	155,000 r/	155,000 r/	140,000

e/ Estimated. r/ Revised.

1/ World totals and estimated data have been rounded to three significant digits; may not add to totals shown.

2/ Antimony content of ore unless otherwise indicated. Table includes data available through June 10, 1999.

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.