

# ANTIMONY

By James F. Carlin, Jr.

Domestic consumption of primary antimony increased substantially in 1994, as did primary and secondary production. Imports of and exports antimony products increased markedly.

Primary antimony metal and oxide were produced by six companies operating six plants using both foreign and domestic feed material. Two plants were in Texas, and there was one each in Idaho, Montana, Nebraska, and New Jersey. Most domestic antimony smelter activity involved upgrading imported antimony oxide to higher purity. A small amount of antimony was recovered as a byproduct from the smelting of lead and silver-copper ores, but most primary antimony metal and oxide produced domestically originated from imports. The estimated value of primary antimony metal and oxide produced in 1994 was \$120 million. The estimated distribution of primary antimony uses was as follows: flame retardants, 57%; transportation, including batteries, 22%; chemicals, 8%; ceramics and glass, 7%; and other, 6%. (*See tables 3, 4, and 5.*)

Secondary antimony produced from domestic scrap source materials was derived mainly from recycled lead-acid batteries. Recycling plus domestic mine output supplied less than one-half of the estimated domestic demand for antimony.

Antimony was mined as a principal product and produced as a byproduct of the smelting of base metal ores in 18 countries. Bolivia, China, Russia, the Republic of South Africa, and Russia together accounted for more than 90% of mine production; China alone accounted for more than 70% of the total world estimated mine antimony production. Identified world antimony reserves at yearend 1994 were estimated to be 4.2 million metric tons. (*See table 10.*)

## Legislation and Government Programs

Public Laws 102-484 and 103-160 provided authorization for additional antimony monthly sales through 1994, or until the 2,722 tons (3,000 short tons) authorized for sale is disposed. Sales of antimony from the National Defense Stockpile took place for the second consecutive year since earlier sales in 1988. Sales were conducted on a sealed bid basis and were held in January, June, October, November,

and December. Sales were held the third Thursday of each month. Each month a maximum of 454 tons (500 short tons) of antimony, either Grade A or Grade B, was offered, usually in the form of ingots or cakes. In 1994, a total of 1,852 tons (2,041 short tons) was sold, with 1,144 tons (1,261 short tons) of the total coming in June. Antimony is stockpiled in Government warehouses in 12 locations, with the Somerville, NJ, depot holding the largest amount.

## Production

**Mine Production.**—In the Coeur d'Alene District of Idaho, Sunshine Mining Co. produced antimony as a byproduct of the treatment of tetrahedrite, a complex silver-copper-antimony sulfide ore. A voluntary U.S. Bureau of Mines canvass form was sent to the lone mine producer and a reply was received.

**Smelter Production.**—The producers of primary antimony metal and oxide products were ASARCO Incorporated, Omaha, NE; Amspec Chemical Corp., Gloucester City, NJ; Anzon Inc., Laredo, TX; Laurel Industries Inc., La Porte, TX; Sunshine Mining Co., Kellogg, ID; and U.S. Antimony Corp, Thompson Falls, MT. A voluntary U.S. Bureau of Mines canvass form was sent to each of these six primary smelters, and a reply was received from each.

Old scrap, predominantly lead battery plates, was the source of almost all 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

Domestic consumption of primary antimony increased moderately in 1994. The most significant increases occurred in the categories of antimonial lead and plastics. Lead-antimony alloys were used in starting- lighting-ignition batteries, ammunition, corrosion-resistant pumps and pipes, tank linings, roofing sheets, solder, cable sheaths, and antifriction bearings. Antimony compounds were used in plastics as stabilizers and as flame retardants. Antimony trioxide in an organic solvent was used to make textiles, plastics, and other combustibles flame

resistant. Antimony was used as a decolorizing and refining agent in some forms of glass, such as optical glass.

Of the 203 consumers to which a voluntary U.S. Bureau of Mines canvass form was sent, all responded.

## Prices

In 1994, antimony metal prices surged strongly. This was attributed initially to shipment delays from the world's largest producer, China, in the early Spring, followed by extensive flooding in the regions of China's major antimony mines and smelters in the late Spring. Production and shipping delays in China reportedly persisted most of the year.

The New York dealer antimony metal price, published by Platt's Metals Week, averaged \$1.78 per pound for the year compared with \$0.77 per pound in 1993. The price range for high-tint antimony trioxide, published by American Metal Market, was \$1.00 to \$1.30 per pound at the beginning of the year and rose to a range of \$3.50 to \$3.75 by the fourth quarter.

## Foreign Trade

Imports of antimony metal rose during the year. China supplied about 83% of the antimony metal. Imports of antimony oxide increased moderately during the year, with China supplying about 38%. (*See tables 8 and 9.*)

## Outlook

Antimony demand rose moderately in 1994, continuing the pattern of steady or rising demand in recent years. That demand increase occurred at a time of surging prices, indicating perhaps the strength of the underlying demand. Much of that consumption increase was in the category of flame retardants, and it is believed that field should expand, although tin and other metals are attempting to penetrate that field with acceptable substitutes having commendable qualities of their own. It is anticipated that the reliance of the United States on imported antimony materials will continue, with China's dominance as a supplier of antimony being a continuing factor.

## **OTHER SOURCES OF INFORMATION**

### **U.S. Bureau of Mines Publications**

Antimony. Ch. in Mineral Commodity Summaries, annual.

Antimony. Ch. in Mineral Facts and Problems, 1985 ed.

### **Other Sources**

Engineering and Mining Journal.

Metal Bulletin (London).

TABLE 1  
SALIENT ANTIMONY STATISTICS 1/

(Metric tons of antimony content unless otherwise specified)

	1990	1991	1992	1993	1994
United States:					
Production:					
Primary:					
Mine (recoverable antimony)	W	W	W	W	W
Smelter	20,600 r/	16,400 r/	20,100 r/	22,600 r/	25,500
Secondary	20,400	19,300	19,900	20,700 r/	24,300
Exports of metal, alloys, waste and scrap	588	694	947	315	1,350
Exports of antimony oxide	7,140	3,750	4,820 e/	3,900 e/	6,500 e/
Imports for consumption	29,400	28,800	31,200	30,900	41,500
Reported industrial consumption, primary antimony	12,800	11,900	12,200	12,400 r/	14,800
Stocks: Primary antimony, all classes, Dec. 31	8,180	10,200	8,740	9,080 r/	10,900
Price: Average, cents per pound 2/	81.8	82.0	79.0	76.9	177.7
World: Mine production	94,400	92,500 r/	76,100 r/	86,300 r/	108,000 e/

e/ Estimated. r/ Revised. W Withheld to avoid disclosing company proprietary data.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits, except prices.

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

TABLE 2  
SECONDARY ANTIMONY PRODUCED IN THE UNITED STATES,  
BY KIND OF SCRAP AND FORM OF RECOVERY 1/

(Metric tons of antimony content unless otherwise specified)

	1993	1994
KIND OF SCRAP		
New scrap: Lead- and tin-base	1,540 r/	1,740
Old scrap: Lead- and tin-base	19,200 r/	22,600
Total	20,700 r/	24,300
FORM OF RECOVERY		
In antimonial lead	20,300 r/	24,000
In other lead- and tin-base alloys	435 r/	332
Total	20,700 r/	24,300
Value	millions \$43	\$51

r/ Revised.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits, except prices; may not add to totals shown.

TABLE 3  
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/	
1993	2,150 r/	10,100 r/	114	12,400 r/
1994	2,550	12,100	124	14,800

r/ Revised.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Includes sulfide and residues.

TABLE 4  
REPORTED INDUSTRIAL CONSUMPTION OF PRIMARY  
ANTIMONY IN THE UNITED STATES, BY PRODUCT 1/

(Metric tons of antimony content)

Product	1993	1994
<b>Metal products:</b>		
Antimonial lead	1,110 r/	1,990
Bearing metal and bearings	44 r/	36
Castings	14	6
Solder	242	179
Other 2/	1,390 r/	1,520
Total	2,810 r/	3,730
<b>Nonmetal products:</b>		
Ammunition primers	24	32
Ceramics and glass	848 r/	980
Pigments	489 r/	369
Plastics	786 r/	1,030
Other 3/	161 r/	77
Total	2,310 r/	2,490
<b>Flame-retardants:</b>		
Adhesives	281 r/	357
Plastics	5,440 r/	6,710
Rubber	344 r/	433
Textiles	431 r/	466
Other 4/	758	622
Total	7,250 r/	8,590
Grand total	12,400 r/	14,800

r/ Revised.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Includes ammunition, cable covering, collapsible tubes and foil, sheet and pipe, and type metal.

3/ Includes fireworks and rubber products.

4/ Includes paper and pigments.

TABLE 5  
INDUSTRY STOCKS OF PRIMARY ANTIMONY  
IN THE UNITED STATES, DECEMBER 31 1/

(Metric tons of antimony content)

Stocks	1993	1990
Metal	2,790 r/	2,770
Oxide	3,320 r/	4,990
Other 2/	2,970	3,170
Total	9,080 r/	10,900

r/ Revised.

1/ Previously published and 1994 data rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Includes ore and concentrate, sulfide and residues.

TABLE 6  
U.S. EXPORTS OF ANTIMONY METAL, ALLOYS, AND  
WASTE AND SCRAP, BY COUNTRY 1/

Country	1993		1994	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Mexico	46	\$95	360	\$1,450
Taiwan	--	--	470	3,410
Other	269 r/	776 r/	521	2,610
Total	315	871	1,350	7,470

r/ Revised.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

Source: Bureau of the Census.

TABLE 7  
U.S. EXPORTS OF ANTIMONY OXIDE, BY COUNTRY 1/

Country	1993			1994		
	Gross weight (metric tons)	Antimony content 2/ (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content 2/ (metric tons)	Value (thousands)
Australia	43	36	\$114	254	211	\$349
Brazil	27	22	102	359	298	760
Canada	816	677	2,070	2,040	1,690	4,250
Colombia	34	28	147	288	239	393
Germany	122	101	372	129	107	129
Italy	362	300	362	245	203	327
Japan	540	448	1,230	721	598	1,760
Mexico	1,410	1,170	1,620	1,390	1,150	1,620
Netherlands	26	22	26	477	396	659
Singapore	748	621	1,390	927	769	2,140
Taiwan	17	14	62	150	125	850
Turkey	46	38	154	333	276	484
United Kingdom	127	105	328	205	170	609
Other	380 r/	315 r/	909 r/	322	266	709
Total	4,690	3,900	8,890	7,840	6,500	15,000

r/ Revised.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Estimated by the U.S. Bureau of Mines.

Source: Bureau of the Census.

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

Country	1993			1994		
	Gross weight (metric tons)	Antimony content 2/ (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content 2/ (metric tons)	Value (thousands)
<b>Antimony ore and concentrate:</b>						
Bolivia	--	--	--	3,660	3,000	\$8,970
Canada	1,500	374	\$775	1,310	381	808
China	97	83	136	608	526	1,720
Kyrgyzstan	--	--	--	1,180	966	3,590
United Kingdom	--	--	--	807	661	1,610
Other	125	86	154	113	99	174
Total	1,720	543	1,070	7,680	5,640	16,900
<b>Antimony oxide:</b>						
Belgium	867	720	2,430	1,010	834	4,310
Bolivia	3,350	2,780	5,020	3,210	2,660	4,880
China	7,020	5,830	9,180	7,960	6,610	22,200
France	241	200	521	274	228	857
Germany	331	275	1,780	154	128	1,740
Hong Kong	201	167	349	170	141	357
Kyrgyzstan	661	549	835	1,050	870	2,370
Mexico	3,060	2,540	2,540	3,930	3,260	2,670
Russia	198	164	236	--	--	--
South Africa, Republic of	3,030	2,510	906	3,200	2,650	925
United Kingdom	67	55	284	247	205	883
Other	293 r/	245 r/	773 r/	111	93	629
Total	19,300	16,000	24,800	21,300	17,700	41,800

r/ Revised.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Antimony ore and concentrate content reported by Bureau of the Census. Antimony oxide content estimated by the U.S. Bureau of Mines.

Source: Bureau of the Census.

TABLE 9  
U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY METAL, BY COUNTRY 1/

Country	1993		1994	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Bolivia	174	\$230	375	\$1,410
Chile	40	54	72	101
China	12,300	20,400	15,500 2/	50,500 2/
Hong Kong	396	652	268	701
Kyrgyzstan	560	831	291	1,350
Japan	72	1,900	72 2/	4,340 2/
Mexico	366	184	1,070	582
Thailand	160	467 r/	178	520
United Kingdom	83	224	192	1,060
Other	180 r/	686 r/	197	1,080
Total	14,400	25,600	18,200	61,700

r/ Revised.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ All or part of these data have been referred to the Bureau of the Census for verification.

Source: Bureau of the Census.

TABLE 10  
ANTIMONY: WORLD MINE PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1990	1991	1992	1993	1994 e/
Australia 3/	1,420	1,500 e/	1,700	1,700 e/	1,700
Austria 4/	352	--	--	--	--
Bolivia	8,450	7,290	6,020	4,160 r/	5,700
Canada 4/	658	469	948	673 r/	750 5/
China e/	54,800	58,300	45,000	60,000 r/	80,000
Czech Republic	XX	XX	XX	250 e/	-- 5/
Czechoslovakia e/ 6/	1,270	1,000	1,000	XX	XX
Guatemala	1,070	609	582	600	600
Kyrgyzstan e/	XX	XX	3,000 r/	2,500 r/	2,500
Mexico 7/	1,670	1,470	1,200 e/	1,470	1,500
Morocco 4/	192	168 r/	197 r/	180 r/	180
Namibia (content of sodium antimonate)	2	10	6	8	14 5/
Pakistan e/	9	11	12	--	--
Peru (recoverable)	307	278	311 r/	215 r/	300
Russia e/ (recoverable)	XX	XX	10,000	8,000 r/	7,000
Slovakia 6/	XX	XX	XX	450 e/	400
South Africa, Republic of 4/	4,820	4,490	3,780	4,110 r/	5,600
Tajikistan e/	XX	XX	1,500	1,200	1,000
Thailand (content of ore and concentrate)	326	60	269	620 r/	500
Turkey	552	370	309	116 r/	100
U.S.S.R. e/ 8/	18,000	16,000	XX	XX	XX
United States	W	W	W	W	W
Yugoslavia 9/	409	350 e/	XX	XX	XX
Zimbabwe 4/	101	160	254	95 r/	100
Total	94,400	92,500	76,100 r/	86,300 r/	108,000

e/ Estimated. r/ Revised. W Withheld to avoid disclosing company proprietary data; not included in "Total." XX Not applicable.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Antimony content of ore unless otherwise indicated. Table includes data available through June 12, 1995.

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

4/ Antimony content of concentrate.

5/ Reported figure.

6/ Dissolved Dec. 31, 1992.

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

8/ Dissolved in Dec. 1991.

9/ Dissolved in Apr. 1992.