

GRAPHITE

By Harold A. Taylor, Jr.

Amorphous graphite was not mined domestically in 1994. Graphite supplies again exceeded industrial demand. Prices of certain kinds of graphite dropped somewhat from those of 1993 while other kinds rose. Quoted prices mostly reflected the existing oversupply. Production of manufactured graphite and graphite fibers increased 4% and decreased 13%, respectively.

Legislation and Government Programs

No acquisitions of graphite for the strategic and critical materials stockpile occurred in 1994. (See table 2.)

Production

United Minerals Co. continued its suspension of production of its amorphous graphitic material from its Montana mine in 1994. Output of manufactured graphite increased 4% to about 276,000 tons, at 29 plants, with a likelihood of some unreported production for in-house use. Production of all kinds of graphite fiber and cloth decreased 13% to 3,550 tons. (See tables 3 and 4.)

Ucar International Inc., a graphite electrode - joint venture of Union Carbide Corp. and Mitsubishi Corp., has been revamped in ownership. Blackstone Group L.P. has assumed a 75% ownership and Union Carbide Corp. will retain a 25% ownership. This supercedes an earlier plan to sell a minority stock-holding to the public. Earnings have been under pressure in recent years from excess electrode capacity.

Domestic production data for synthetic graphite are developed by the U.S. Bureau of Mines (USBM) from a voluntary survey of domestic producers. Of the 29 operations polled, 100% responded. This represented 100% of the total production data shown in table 4. (See table 1.)

Consumption

Reported consumption of natural graphite decreased 5% to about 38,800 tons, according to a survey of more than 230 users. The three major uses of natural graphite were refractories, brake linings, and in packings, which together accounted for 59% of reported consumption. (See table 5.)

Prices

Natural graphite prices are often negotiated between the buyer and seller and are based on purity and other criteria. Therefore, published price quotations such as those in Industrial Minerals are given as a range of prices. Another source of information for graphite prices is the average customs value per ton of the different imported classes. These mainly represent shipments of unprocessed graphite. A third source for natural graphite prices is the amount paid per ton at the point of consumption.

The price for crystalline graphite at the point of consumption--mostly crystalline flake, some crystalline dust, and a little lump graphite--dropped slightly to \$1,466 per ton from \$1,469. The price for amorphous graphite (including small amounts of amorphous-synthetic graphite mixtures) rose slightly to \$687 per ton from \$683. (See table 6.)

Foreign Trade

Total exports of natural graphite increased 17%. Exports of graphite electrodes totaled 107,100 tons valued at \$253.3 million, of which 67,500 tons (\$104.4 million) went to Canada. Imports of natural graphite increased slightly from those of 1993. (See tables 7, 8, and 9.)

World Review

World natural graphite markets, like the domestic graphite market, were about the same as in the last several years, namely, mediocre. Domestic natural graphite consumption (apparent) backed off from 1993. Actual graphite consumption sustained a small loss. Domestic prices of imported graphite were mixed but trended upward. A Canadian producer, Victoria Graphite Inc., came on-stream while another much larger Canadian producer, the former Cal Graphite Corp., closed, for a sizable net loss in Canadian capacity. Production of graphite from kish did not advance into larger-volume production. Nothing noteworthy occurred in sales of graphite from the stockpile.

Canada.—Victoria Graphite Inc. came on-stream in mid-1994 with its new mine and plant at Portland, Ontario. The firm has the advantage of using ore running 8% to 10% graphite. The plant has a maximum capacity of 3,000 tons of flake graphite concentrate per year, and will also make expanded graphite when the necessary equipment is installed. The firm also plans to produce graphite foil in 1995, under a Japanese technology license.

Malawi.—Two South African companies have won a contract from a consortium of Malawian investors to build a graphite mine and plant at Katengeza, following a feasibility study and drilling and trenching the deposit. The South African firms, Metallurgical Design and Management (Pty.) Ltd. and Unique Engineering Ltd., also have the contract for building a new Tanzanian mine and plant at Merelani.

Namibia.—A local mining company, Roselis Mining Co., was looking for partners to explore and develop to the production stage two flake graphite deposits near Swakopmund and easily accessible to Walvis Bay. The firm's diamond drilling has shown that one of the deposits, the Tippy's, has reserves of 12 million tons averaging 6% graphite, and the other deposit, the Mary's, has reserves of 20 million tons, both amenable to open pit recovery.

Sweden.—Superior Graphite Co. will begin producing its Desulco at a 15,000 ton-capacity synthetic graphite plant at Sundsvall that was formerly operated under license from Superior by Casco Nobel.

Switzerland.—Aluisse-Lonza Holding Ltd. has sold its synthetic graphite subsidiary, Lonza Graphites + Technologies Ltd., to Mircal, a subsidiary of the French Imetal Group. Lonza has two plants in Switzerland that produce synthetic graphite and high-temperature lubricants. Imetal also owns 25% of Stratmin Graphite Inc., a Canadian producer of natural flake graphite.

Current Research and Technology

The USBM has demonstrated a new processing method to produce high-quality flake graphite from kish, a steelmaking waste. Kish is typically a mixture of graphite, desulfurization slag, and iron which is skimmed

from the hot metal fed to the basic oxygen furnace. The graphite content of kish is estimated to be enough to meet total U.S. demand for flake graphite. The crude kish is first treated by screening and hydraulic classification, and then leached with hydrochloric acid to give a 95% graphite product with flake ranging from 10 mesh down.¹

Outlook

Projected demand for crystalline flake graphite totaled 27,000 tons for 1995 and 32,000 tons for the year 2000. Demand for other graphite, mostly amorphous, totaled 15,000 tons for 1995 and 13,000 tons for the year 2000. This very slow growth rate reflects the maturity of the market, mostly in refractories, and particularly in carbon-magnesite brick. Production capacity is unlikely to increase from the present level while the overcapacity exists.

¹Lavery, P. D., L. J. Nicks, and L. A. Walters. Recovery of Flake Graphite from Steelmaking Kish. BuMines RI 9512, 1994, 23 pp.

OTHER SOURCES OF INFORMATION

U.S. Bureau of Mines Publications

Graphite. Ch. in Mineral Commodity Summaries, annual.

Graphite. Ch. in Annual Report, annual.

Graphite. Reported annually in Mineral Industry Surveys.

Other Sources

Chemical Week.

European Chemical News.

Industrial Minerals (London).

Materials Engineering.

Wall Street Journal.

TABLE 1
SALIENT NATURAL GRAPHITE STATISTICS 1/

		1990	1991	1992	1993	1994
United States:						
Production	metric tons	--	--	--	--	--
Apparent consumption 2/	do.	38,700	14,200	29,500	34,800	32,900
Exports	do.	11,500	19,400	20,200	17,400	20,300
Value	thousands	\$9,480	\$11,300	\$12,200	\$11,100	\$13,100
Imports for consumption	metric tons	50,200	33,500	49,700	52,200	53,100
Value	thousands	\$35,200	\$21,700	\$25,500	\$29,900	\$26,900
World: Production	metric tons	946,000 r/	771,000	745,000 r/	731,000 r/	719,000 e/

e/ Estimated. r/ Revised.

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

2/ Domestic production plus imports minus exports.

TABLE 2
U.S. GOVERNMENT STOCKPILE GOALS AND YEAREND
STOCKS OF NATURAL GRAPHITE IN 1994, BY TYPE

(Metric tons)

Type	Goal	National stockpile inventory
Madagascar crystalline flake	(1/)	15,200
Sri Lanka amorphous lump	12,200	4,930
Crystalline, other than Madagascar and Sri Lanka	(1/)	1,750
Nonstockpile-grade, all types	(1/)	846

1/ This commodity no longer has a goal.

Source: Defense National Stockpile Center, Inventory of Stockpile Materials
as of Dec. 31, 1994.

TABLE 3
PRINCIPAL PRODUCERS OF SYNTHETIC GRAPHITE IN 1994

Company	Plant location	Product 1/
Amoco Performance Products Co.	Greenville, SC	Cloth, high modulus fibers.
Ashland Petroleum	Ashland, KY	High modulus fibers.
Black Diamond Graphite, Metallics Systems Div.	Sanborn, NY	Unmachined shapes.
Carbone of America	St. Marys, PA	Motor brushes; unmachined shapes; other.
Fiber Materials, Inc.	Biddeford, ME	Other.
Fiber Technology Corp.	Provo, UT	--
Fortafil Fibers Inc.	Rockwood, TN	High modulus fibers.
B F Goodrich Co., Engineered Systems Div., Super Temp Operations	Santa Fe Springs, CA	Other.
Grafil Inc.	Sacramento, CA	High modulus fibers.
Hercules Inc.	Salt Lake City, UT	Do.
HITCO Materials Group, B P Chemicals Ltd.	Gardena, CA	Cloth.
Minerals Technology, Inc.; Specialty Minerals Corp.	Easton, PA	Other.
National Electrical Carbon Co.	Fostoria, OH	Unmachined shapes; high modulus fibers.
NAC Carbon Products, Inc.	Punxsutawney, PA	Other.
Polycarbon, Inc.	Valencia, CA	Cloth.
Showa Denko Carbon Inc.	Ridgeville, SC	Electrodes; other.
SGL Carbon Corp.	Hickman, KY	Anodes; crucibles; electrodes; unmachined shapes; other.
Do.	Morganton, NC	Do.
Do.	Niagara Falls, NY	Do.
Do.	Ozark, AR	Do.
Superior Graphite Co.	Russellville, AR	Electrodes.
Do.	Hopkinsville, KY	Other.
Textron Specialty Materials	Lowell, MA	High modulus fibers.
The Carbide/Graphite Group, Inc.; Graphite Specialties	Niagara Falls, NY	Anodes; crucibles; motor brushes; electrodes; unmachined shapes; refractories; other.
Do.	St. Marys, PA	Do.
UCAR Carbon Company, Inc.	Clarksburg, WV	Anodes; electrodes; unmachined shapes; other.
Do.	Clarksville, TN	Do.
Do.	Columbia, TN	Do.
Zoltek Corp.	St. Charles, MO	High modulus fibers.

1/ Cloth includes low-modulus fibers; motor brushes include machined shapes; crucibles includes vessels.

TABLE 4
U.S. PRODUCTION OF SYNTHETIC GRAPHITE, BY END USE 1/

End use	1993		1994	
	Quantity (metric tons)	Value (thou- ands)	Quantity (metric tons)	Value (thou- ands)
Anodes 2/	W	W	W	W
Cloth and fibers (low-modulus)	37	\$4,540	62	\$5,170
Crucibles and vessels and refractories 2/	W	W	W	W
Electric motor brushes and machined shapes	2,510 r/	18,700	W	W
Electrodes	172,000 r/	411,000 r/	177,000	467,000
Graphite articles 3/	--	38,700	--	41,200
High-modulus fibers	4,050	158,000	3,490	126,000
Unmachined graphite shapes	4,240	27,600	8,780	42,100
Other	13,300 r/	50,500 r/	20,400	78,000
Total	196,000 r/	709,000 r/	209,000	759,000
Synthetic graphite powder and scrap 4/	69,100	36,400	66,600	34,600
Grand total	265,000 r/	745,000 r/	276,000	794,000

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; may not add to totals shown.

2/ Anodes, crucibles/vessels and refractories end products are included in the "Other" products category.

3/ Includes all items for which quantity data are usually unavailable.

4/ Includes lubricants (alone/in greases), steelmaking carbonraisers, additives in metallurgy, and other powder data.

TABLE 5
U.S. CONSUMPTION OF NATURAL GRAPHITE, BY USE 1/

End use	Crystalline		Amorphous 2/		Total	
	Quantity (thou- sands)	Value (thou- sands)	Quantity (thou- sands)	Value (thou- sands)	Quantity (thou- sands)	Value (thou- sands)
1992:	24,300	\$35,900	17,500	\$11,800	41,800	\$47,800
1993:						
Batteries	W	W	W	W	606	1,410
Brake linings	1,670	2,270	5,050	4,210	6,720	6,480
Carbon products 3/	561	1,620	493	331	1,050	1,950
Crucibles, retorts, stoppers, sleeves and nozzles	W	W	W	W	995	1,020
Foundries 4/	720	840	2,220	1,210	2,940	2,050
Lubricant group:						
Lubricants	708	1,230	2,430	1,560	3,140	2,790
Packing; other 5/	4,220	6,050	86	134	4,310	6,180
Pencils	2,560	2,950	236	169	2,800	3,120
Powdered metals	2,000	4,120	372	302	2,370	4,430
Refractories	7,750	8,730	2,730	757	10,500	9,490
Rubber	189	287	424	375	613	662
Steelmaking	W	W	W	W	1,720	1,030
Other 6/	1,460	4,160	1,650	1,470	3,110	5,630
Withheld uses	1,460	1,980	1,860	1,480	--	--
Total	23,300	34,200	17,600	12,000	40,900	46,200
1994:						
Batteries	455	1,110	140	438	595	1,550
Brake linings	2,580	3,010	5,710	4,650	8,290	7,600
Carbon products 3/	660	1,890	490	384	1,150	2,270
Crucibles, retorts, stoppers, sleeves and nozzles.	1,020	956	6	10	1,030	966
Foundries 4/	659	697	1,500	783	2,160	1,480
Lubricant group:						
Lubricants	568	1,110	1,670	1,080	2,350	2,080
Packing; other 5/	4,860	6,100	119	193	4,980	6,290
Pencils	1,520	1,650	167	104	1,690	1,750
Powdered metals	1,840	3,930	51	101	1,890	4,030
Refractories	6,730	8,100	2,890	774	9,620	8,880
Rubber	156	397	703	542	859	939
Steelmaking	47	796	1,130	674	1,180	1,470
Other 6/	984	2,660	2,070	1,670	3,060	4,330
Withheld uses	--	--	--	--	--	--
Total	22,100	32,400	16,600	11,400	38,800	43,600

W Withheld to avoid disclosing company proprietary data; included with "Withheld uses" and "Total" where 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/ Includes mixtures of natural and manufactured graphite.

3/ Includes bearings and carbon brushes.

4/ Includes foundries (other) and foundry facings.

5/ Includes packings; ammunition; and seed coating.

6/ Includes paints and polishes; small packages; antiknock and other compounds; soldering/welding; mechanical products; electrical/electronic devices; industrial diamonds; drilling mud; magnetic tape; and other end-use categories.

TABLE 6
REPRESENTATIVE YEAREND GRAPHITE PRICES

(Per metric ton)

Type	1993	1994
Industrial minerals: 1/ 2/		
Crystalline large flake, 85% to 90% carbon	\$400 - \$600	\$400 - \$600
Crystalline medium flake, 85% to 90% carbon	300 - 500	300 - 500
Crystalline small flake, 80% to 90% carbon	250 - 500	250 - 500
Amorphous powder, 80% to 85% carbon	220 - 440	220 - 300
Custom value, at foreign ports: 3/		
Flake	612 r/	629
Lump and chip, Sri Lankan	789	709
Amorphous, Mexican	127	138

r/ Revised.

1/ Prices are normally "Cost, insurance, and freight" (C.i.f.) main European port.

2/ Source: "Industrial Minerals;" No. 315, Dec. 1993, p. 54 and No. 327, Dec. 1994, p. 62.

3/ Source: Department of Commerce, Bureau of the Census, adjusted by the U.S. Bureau of Mines.

TABLE 7
U.S. EXPORTS OF NATURAL AND ARTIFICIAL GRAPHITE, BY COUNTRY 1/ 2/

Country	Natural 3/		Artificial 4/		Total	
	Quantity (Metric tons)	Value 5/	Quantity (Metric tons)	Value 5/	Quantity (Metric tons)	Value 5/
1993:						
Canada	3,880	\$2,515,000	13,800	\$5,944,000	17,700	\$8,459,000
Japan	275	429,000	3,260	6,240,000	3,530	6,670,000
Korea, Republic of	38	42,000	4,500	2,840,000	4,540	2,880,000
Mexico	7,450	2,770,000	742	488,000	8,190	3,250,000
Other	5,710 r/	5,400,000 r/	12,700 r/	15,300,000 r/	14,600	16,000,000
Total	17,400	11,100,000	35,000	30,900,000	52,400	42,000,000
1994:						
Canada	4,060	2,610,000	6,520	9,340,000	10,600	11,900,000
Japan	428	483,000	8,130	4,460,000	8,560	4,940,000
Korea, Republic of	94	134,000	5,050	2,700,000	5,140	2,840,000
Mexico	6,650	2,710,000	1,620	889,000	8,270	3,600,000
Other	9,020	7,140,000	16,500	22,100,000	25,500	29,200,000
Total	20,300	13,100,000	37,800	39,500,000	58,100	52,500,000

r/ Revised.

1/ Previously published and 1994 data are rounded to three significant digits; may not add to totals shown.

2/ Numerous countries for which data were reported have been combined within the "Other" category under the "Country" list.

3/ Amorphous, crystalline flake, lump and chip and natural, not elsewhere classified. The applicable "Harmonized Tariff Schedule" (HTS) nomenclature title and code(s) are: "Natural graphite in powder or in flakes"/"Other;" HTS Nos. 2504.10/90.0000.

4/ Includes data from the applicable "Harmonized Tariff Schedule" (HTS) nomenclatures: "Artificial graphite" and "Colloidal or semicolloidal graphite;" their respective HTS code Nos. are 3801.10/.20.0000.

5/ Values are F.a.s..

Source: Bureau of the Census.

TABLE 8
U.S. IMPORTS FOR CONSUMPTION OF NATURAL GRAPHITE, BY COUNTRY 1/ 2/

Country or territory	Crystalline flake and flake dust		Lump and chippy dust		Other natural crude; high- purity; expandable.		Amorphous		Total	
	Quantity (metric tons)	Value 3/ (thou- sands)	Quantity (metric tons)	Value 3/ (thou- sands)	Quantity (metric tons)	Value 3/ (thou- sands)	Quantity (metric tons)	Value 3/ (thou- sands)	Quantity (metric tons)	Value 3/ (thou- sands)
1992	21,100 r/ 4/	\$14,020 r/ 4/	492	\$528	12,500 r/ 5/	\$8,760 r/ 5/	15,700	\$2,230	49,700	\$25,500
1993:										
Australia	1	6	--	--	--	--	--	--	1	6
Austria	--	--	--	--	--	--	20	10	20	10
Brazil	(6/)	(6/)	--	--	3,280 r/	4,530 r/	--	--	3,280	4,530
Canada	16,900 r/	10,000 r/	--	--	961 r/	407 r/	--	--	17,900	10,400
China	616 r/	380 r/	--	--	8,690 r/	3,760 r/	91	14	9,390	4,150
France	76	182	--	--	57	435	--	--	133	617
Germany	(6/)	(6/)	--	--	157 r/	1,860 r/	--	--	157	1,860
Hong Kong	--	--	--	--	--	--	385	61	385	61
India	21	10	--	--	199	279	--	--	220	288
Japan	--	--	--	--	333	1,660	--	--	333	1,660
Madagascar	3,350 r/	2,370 r/	--	--	(6/)	(6/)	--	--	3,350	2,370
Mexico	--	--	--	--	387	162	13,700	1,730	14,100	1,890
Mozambique	--	--	--	--	--	--	--	--	--	--
Norway	56	23	--	--	--	--	--	--	56	23
South Africa, Republic of	74	111	--	--	--	--	--	--	74	111
Sri Lanka	--	--	712	562	--	--	--	--	712	562
Switzerland	(7/)	7	--	--	10	117	--	--	11	124
Ukraine	--	--	--	--	16	60	--	--	16	60
United Kingdom	101	123	--	--	20	10	--	--	121	134
Zimbabwe	1,740 r/	851 r/	--	--	(6/)	(6/)	--	--	1,740	851
Other 8/	214 r/	107 r/	--	--	(7/)	14	--	--	214 r/	121 r/
Total	23,200 r/	14,200 r/	712	562	14,100 r/	13,300 r/	14,200	1,820	52,200	29,900
1994:										
Australia	324	84	--	--	--	--	--	--	324	84
Austria	--	--	--	--	--	--	20	12	20	12
Brazil	--	--	--	--	3,050	4,210	--	--	3,050	4,210
Canada	14,400	9,120	--	--	622	241	--	--	15,000	9,360
China	823	306	--	--	8,070	2,490	2,400	250	11,300	3,050
France	146	154	--	--	105	802	--	--	252	955
Germany	--	--	--	--	127	373	--	--	127	373
Hong Kong	--	--	--	--	--	--	144	22	144	22
India	17	29	--	--	220	257	--	--	237	286
Japan	--	--	--	--	256	1,590	--	--	256	1,590
Madagascar	3,710	2,650	--	--	--	--	--	--	3,710	2,650
Mexico	--	--	--	--	321	257	15,800	2,170	16,100	2,430
Mozambique	--	--	--	--	62	51	--	--	62	51
Norway	17	7	--	--	93	35	--	--	110	42
South Africa, Republic of	18	34	--	--	31	241	--	--	49	275
Sri Lanka	--	--	718	509	--	--	--	--	718	509
Switzerland	--	--	--	--	54	71	--	--	54	71
Ukraine	--	--	--	--	--	--	--	--	--	--
United Kingdom	27	99	--	--	4	32	--	--	31	132
Zimbabwe	580	354	--	--	--	--	--	--	580	354
Other 8/	1,020	399	--	--	(7/)	13	--	--	1,020	412
Total	21,000	13,200	718	509	13,000	10,700	18,400	2,460	53,100	26,900

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/ The information framework from which data for this material were derived originated from Harmonized Tariff Schedule (HTS) base data.

3/ Customs values.

4/ Revisions include Canada, 16,100 tons valued at \$10,000,000 ; China, 373 tons valued at \$241,000; Madagascar, 3,350 tons valued at \$2,730,000; and Zimbabwe, 994 tons valued at \$760,000. Brazil, Germany, and Japan are revised to zero.

5/ Revisions include Brazil, 1,620 tons valued at \$2,510,000; Canada, 516 tons valued at \$215,000; China, 6,420 tons valued at \$3,430,000; Germany, 64 tons valued at \$250,000; and Japan, 3,190 tons valued at \$1,410,000. Madagascar and Zimbabwe data are revised to zero.

6/ Revised to zero.

7/ Less than 1/2 unit.

8/ Includes Armenia (1993), Belgium (1993), Israel (1993), Italy (1993), Namibia (1993), Poland and Taiwan.

Source: Bureau of the Census, adjusted by the U.S. Bureau of Mines.

TABLE 9
U.S. IMPORTS FOR CONSUMPTION
OF GRAPHITE ELECTRODES, BY COUNTRY 1/ 2/

Country	Quantity 3/ (metric tons)	Value 4/ (thousands)
1993:		
Canada	5,410	\$8,320
Germany	2,180	5,890
Italy	5,730	9,010
Japan	6,370	12,200
Mexico	10,500	15,400
Other r/	3,790	9,610
Total	34,000	57,800
1994:		
Canada	11,900	28,400
Germany	2,950	8,400
Italy	6,260	10,000
Japan	7,840	20,600
Mexico	10,200	14,700
Other	6,490	12,800
Total	45,700	95,000

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/ The applicable "Harmonized Tariff Schedule" (HTS) code and nomenclature title are: (HTS 8545.11.0000); "Electric Furnace Electrodes."

3/ For both 1993 and 1994, for countries reflecting less than 1,000 metric tons each for yearly imports, data have been combined under the "Other" category in the "Country" list.

4/ Customs values.

Source: Bureau of the Census.

TABLE 10
GRAPHITE: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1990	1991	1992	1993	1994 e/
Argentina	318 r/	85 r/	20 r/	20 r/ e/	25
Austria	22,700	19,800	19,800 r/	4,150 r/	--
Brazil (marketable) 3/	28,900	27,000	29,400	29,500 r/	29,000
Burma 4/	45	36	--	--	--
Canada (exports of natural graphite)	10,200	6,200	17,400	18,700 r/	15,800
China e/	455,000	289,000	300,000	310,000	320,000
Czech Republic	XX	XX	XX	27,000 r/	25,000
Czechoslovakia 5/	39,000	47,000	20,000 e/	XX	XX
Germany	19,300	15,800	12,000	8,360 r/	8,000
India (run-of-mine) 6/	61,000	69,900	73,000 r/	74,700 r/	75,000
Korea, North e/	35,000	35,000	38,000	38,000	38,000
Korea, Republic of:					
Amorphous	99,000	75,200	75,000 e/	72,000 e/	72,000
Crystalline flake	703	1,550	8,410	5,910 r/	6,000
Madagascar	18,000	14,100	8,910	8,000 e/	8,000
Mexico:					
Amorphous	22,600	35,300	30,500 r/	42,600 r/	43,000
Crystalline flake	2,370	1,940	985	960 r/	1,000
Namibia e/	--	200	200	-- r/	--
Norway e/	5,000	6,930 7/	7,000 r/	6,500 r/	6,000
Romania e/	6,000	6,000	2,300 7/	2,000	2,070 7/
Russia e/	XX	XX	15,000	10,000	8,000
Sri Lanka	5,470	6,380	3,310	5,160 r/	5,000
Turkey (run-of-mine) 8/	18,700	25,900	21,000	20,000 e/	20,000
Ukraine e/	XX	XX	50,000	40,000	30,000
U.S.S.R. e/ 9/	80,000	75,000	XX	XX	XX
Zimbabwe	16,400	12,900	12,300	7,140 r/	7,200
Total	946,000 r/	771,000	745,000 r/	729,000 r/	720,000

e/ Estimated. r/ Revised. 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/ Table includes data available through May 18, 1995.

3/ Does not include the following quantities sold directly without beneficiation, in metric tons: 1990-8,400; 1991--7,300; 1992--8,960; 1993--9,960 (revised); and 1994--10,000 (estimated).

4/ Data are for fiscal years beginning Apr. 1 of that stated.

5/ Dissolved Dec. 31, 1992. All production in Czechoslovakia from 1990-92 came from what is now the Czech Republic.

6/ Indian marketable production is 10% to 20% of run-of-mine production.

7/ Reported figure.

8/ Turkish marketable production averages approximately 5% of run-of-mine production. Almost all is for domestic consumption.

9/ Dissolved in Dec. 1991.