

MAGNESIUM COMPOUNDS

By Deborah A. Kramer

U.S. magnesia production from all sources (seawater, brines, magnesite, olivine, and dolomite) increased about 4% in 1995, but apparent demand increased by about 8%. Production of refractory magnesia declined, and imports, primarily from China, met a significant portion of the U.S. demand. Refractories accounted for about 70% of the total U.S. demand for magnesium compounds. Caustic-calcined magnesia production increased, partially to meet the increased demand for this material in water treatment and other acid neutralization applications.

Legislation and Government Programs

As part of broader negotiations with North Korea, the U.S. Department of the Treasury issued regulations that would allow the importation of North Korean magnesite or magnesia into the United States with specific licenses.¹ This would be North Korea's first entry into the U.S. market since the Korean War.

Production

In January, PQ Corp. announced that it would build a plant in Utica, IL, with a capacity of 25,000 metric tons per year of magnesium sulfate solution. The company already operated a magnesium sulfate crystal plant at the Utica site. The new plant, which will be expandable to meet future market needs, was expected to be operational in early 1996.²

Great Salt Lake Minerals Corp. completed the first of a two-phase expansion of its magnesium chloride hexahydrate facilities in August. The expansion increased annual production capacity from 10,900 tons to 31,800 tons. The second phase, which will increase capacity to 90,000 tons per year was scheduled to be completed by December 1996.³ (*See tables 1 and 2.*)

Data for magnesium compounds were collected from one voluntary survey of U.S. operations. Of the 18 operations canvassed, 72% responded, representing 67% of the magnesium compounds shipped and used shown in table 3. Data for the five nonrespondents were estimated based on prior-year consumption levels and other factors.

Two companies in the United States produced olivine—Unimin Corp. and Olivine Corp. Unimin operated two mines, one in North Carolina and one in Washington, and processing plants in Indiana, North Carolina, and Washington; Olivine operated one mine and one processing plant in Washington.

The largest magnesite production facilities in the world are in China, North Korea, and Russia. Together, these three

countries account for 58% of the world magnesite production capacity. Japan and the United States account for 60% of the world's magnesium compounds production capacity from seawater or brines. Fused magnesia is produced in Australia, Brazil, Canada, China, France, Germany, Israel, Japan, the Republic of Korea, Mexico, the United Kingdom, and the United States.

Norway, the world's principal producer of olivine, supplied its domestic needs and was a major world supplier of olivine. Countries with smaller output included Austria, Italy, Japan, Mexico, Pakistan, Spain, and the United States. A review of the world's olivine producers was published in February.⁴

Consumption

In 1995, chemical applications were the dominant use for caustic-calcined magnesia, accounting for 48% of U.S. shipments. The following categories, with the individual components in parentheses in declining order, were the other end-use sectors for caustic-calcined magnesia: metallurgical (water treatment, refractories, and electrical), 27%; agriculture (animal feed and fertilizers), 10%; manufacturing (rubber, fluxes, pulp and paper, fuel additives, and foundry), 6%; construction (oxychloride and oxysulfate cements and general construction), 4%; pharmaceuticals and nutrition (medicinal and pharmaceutical, sugar, and candy), 4%; and unspecified uses, 1%. Water treatment was the application that exhibited the largest growth rate between 1994 and 1995 and was the second largest individual use of caustic-calcined magnesia.

Magnesium carbonate was used principally as a chemical intermediate, in rubber processing, and in cosmetics. Magnesium hydroxide was used mainly in the chemical industries and for water treatment. Magnesium sulfate was used mostly in pharmaceuticals and animal feed.

Magnesium chloride was used mainly as a chemical intermediate. Magnesium chloride brines were used principally for road dust and ice control.

Foundry uses remained the largest application for olivine in the United States, accounting for 85% of consumption of domestically produced material. Refractory applications accounted for 8% of U.S. demand, and sandblasting and other abrasive uses accounted for 7%. (*See table 3.*)

Prices

Yearend magnesium compounds prices quoted in Chemical Marketing Reporter did not change from those at yearend 1994. U.S. olivine prices, quoted in Industrial Minerals, were \$62 to

\$109 per ton for foundry grade and \$50 to \$78 per ton for aggregate material, the same as price quotes at yearend 1994. All prices were quoted f.o.b. mine or plant. (See table 4.)

Foreign Trade

Minerals Technology Inc. reportedly signed an agreement with North Korean Magnesite Clinker Export and Import Co. to import dead-burned magnesia into the United States. Although no specific level of imports was cited, Minerals Technology said that the 1-year agreement would allow the importation of tens of thousands of tons of magnesia.⁵

Olivine trade data are not reported separately by the Bureau of the Census, but some trade information is available from the Journal of Commerce Port Import/Export Reporting Service (PIERS). This service only reports material that travels by ship. According to PIERS, 96,700 tons of olivine was imported into the United States from Norway. A total of 1,100 tons of olivine was exported in 1995. Chile (76%) and the Republic of Korea (11%) were the principal destinations. (See tables 5, 6, 7, and 8.)

World Review

Australia.—Queensland Metals Corp. Ltd. planned to increase the fused magnesia capacity of its QMAG facility by 5,000 tons per year to 29,000 tons per year. This expansion, spurred by strong customer demand in the refractories sector, will be QMAG's second expansion; the first phase was completed in January 1995.⁶

China.—Export license changes and restructuring of the country's largest magnesite producer have led to uncertainties for users of Chinese magnesia. Liaoning Magnesite and Refractories Corp. announced that it would separate into four independent units, each managed by a different entity. The four operating units are Liaoning's 50,000-ton-per-year plant that produces high-grade, dead-burned magnesia, the Qinhua Yu Mine and its associated shaft kilns, the Huaeziyu Mine and associated shaft kilns, and the Dashiqiao refractories plant.⁷ Liaoning Magnesite also announced that it would limit its production to premium and exportable grades of magnesia only. One of the reasons given for this decision was the rising cost of mining and energy.

In June, China announced that it would issue a new set of regulations regarding the bidding for export licenses for magnesia and fluorspar. All bids with prices deviating from what the Government considered the normal price level will be declared invalid. Also, there will be a specific percentage range established above and below the average price in which the winning bids must fall. In addition, the Government will calculate major production areas through a specific formula, which enables certain traditional producers and exporters a better chance of securing export licenses.⁸

In addition to export licenses, China imposed a resource tax on magnesite and associated products, which include caustic-calcined, dead-burned, and fused magnesias, beginning January

1, 1995. The extra charge was added to the original price and was paid by the purchasers of the material. The new tax ranged from \$3.55 per ton for crude magnesite to \$11.84 per ton for fused magnesia.⁹

Colombia.—Volumenes Ltda. announced plans to develop a dunite deposit in Colombia and is seeking partners for the venture for technical and financial input. The company completed a prefeasibility study and has installed a 1,200-ton-per-year pilot plant at the site to produce foundry sands. The dunite deposit is located in the western half of the country, spanning the Departments of Antioquia, Cauca, Choco, and Valle. If a full-scale plant is developed, Volumenes planned to market the foundry sand domestically as well as in Chile, Peru, and Venezuela.¹⁰

Germany.—In December, Hüls AG announced that it would withdraw from the fused magnesia business. Hüls operated a 15,000-ton-per-year fused magnesia plant in Niederkassel and was the world's second-largest fused magnesia supplier. Production was expected to cease by the end of the first quarter of 1996.¹¹

Greece.—The assets of former magnesia producer Mineral, Commercial, and Industrial SA were scheduled to be auctioned off by the end of the year. The operation stopped active production in 1988, and the assets consisted of two mining concessions in Euboea, prebeneficiation and beneficiation facilities, and two shaft kilns for the production of caustic-calcined magnesia. Under terms of the auction, any buyer of the operation would have an obligation to keep the facility operating for 5 years from the date of purchase.¹²

India.—Construction began on India's first seawater magnesia plant, with startup expected in June 1996. The owner of the new plant, Aditya Birla Group Co., a subsidiary of India Rayon Ltd., held discussions with Refractories Consulting & Engineering GmbH to expand the plant to produce 8,000 to 10,000 tons of fused magnesia per year.¹³

Japan.—Japan's Shin Nihon Chemical Industry Co. Ltd. closed its 100,000-ton-per-year Minamata dead-burned magnesia plant in July. The principal reason for the closure was competition from cheaper imports of fused magnesia, particularly from China. Shin Nihon was Japan's second-largest magnesia producer before the closure; the two remaining plants are Ube Chemical Industries Co. Ltd.'s 450,000-ton-per-year plant and Asahi Glass Co.'s 30,000-ton-per-year captive plant.¹⁴

Norway.—North Cape Minerals A/S, a subsidiary of Unimin of the United States, purchased the olivine operations of Franzfoss Bruk A/S for an undisclosed sum. North Cape planned to continue the debottlenecking operations that were started by Franzfoss Bruk. Production at the Lefdal operation was expected to be 450,000 to 500,000 tons in 1995, with about 90% of the material to be used as a slag conditioner. North Cape Minerals planned to continue to supply about 30,000 tons per year of olivine to Unimin in the United States.¹⁵

Pakistan.—Syndicate Mines & Minerals (Pvt.) Ltd. and Pakistan Industrial Development Corp. (PIDC) set up a joint-venture firm, Magnesite Refractories Ltd., to manage a new basic refractory brick manufacturing plant. Design capacity of

the plant was 30,000 tons per year of calcined magnesite and 25,000 tons per year of refractory bricks. PIDC's deposit at Khumar, 150 kilometers from the refractory plant was expected to supply the magnesite for the facility. No timetable has been set for completion; however, the refractory bricks were expected to be marketed locally.¹⁶

Slovakia.—The Government-owned magnesia operation was privatized in 1995 and is now known as Magnatech Slovakia spol.sro. This company was expanding magnesia output at the facility and has partially rebuilt two 25,000-ton-per-year rotary kilns in order to improve the product. The company also operated a 26,000-ton-per-year chemical plant that produces high-purity caustic-calcined and dead-burned magnesias at the site.¹⁷ (See tables 9 and 10.)

Outlook

Overall demand for magnesium compounds was expected to remain essentially the same for the next few years. Imports, particularly for dead-burned magnesia, were expected to continue to supply a significant share of U.S. consumption. China should remain the dominant source of imported magnesia, but the additional fees charged by the Chinese Government may increase the cost to consumers and open the door for imports from North Korea, a potentially less expensive source. However, quality considerations may limit the applications for magnesia from North Korea.

¹Federal Register. Foreign Assets Control Regulation; North Korean Travel and Financial Transactions; Information and Informational Materials, (Dep. Treasury). V. 60, No. 32, Feb. 16,

1995, pp. 8933-8936.

²Chemical Week. V. 156, No. 4, Feb. 1, 1995, p. 22.

³Chemical Marketing Reporter. V. 248, No. 8, Aug. 21, 1995, p.

4.

⁴Skillen, A. Olivine. Ind. Miner. (London). No. 329, Feb. 1995, pp. 23-31.

⁵North American Minerals News. No. 3, Aug. 1995, p. 2.

⁶Industrial Minerals (London). No. 336, Sept. 1995, p. 9.

⁷———. No. 332, May 1995, pp. 9-10.

⁸———. No. 333, June 1995, p. 10.

⁹———. No. 329, Feb. 1995, p. 9.

¹⁰———. No. 337, Oct. 1995, pp. 11 and 13.

¹¹———. No. 341, Feb. 1996, p. 14.

¹²Page 13 of work cited in footnote 10.

¹³Industrial Minerals (London). No. 335, Aug. 1995, p. 11.

¹⁴Pages 11-12 of work cited in footnote 13.

¹⁵Page 12 of work cited in footnote 9.

¹⁶Page 12 of work cited in footnote 13.

¹⁷Industrial Minerals (London). No. 339, Dec. 1995, p. 16.

OTHER SOURCES OF INFORMATION

U.S. Geological Survey Publications

Magnesium Compounds. Ch. in Mineral Commodity Summaries, annual.

Magnesian Refractories. Ch. in U.S. Geological Survey Professional Paper 820, United States Mineral Resources, pp. 379-384.

Other Sources

Industrial Minerals (London), monthly.

Roskill Information Services Ltd. Magnesium Compounds 1992, 7th ed.

Roskill Information Services Ltd. Olivine 1990, 2d ed.

TABLE 1
SALIENT MAGNESIUM COMPOUND STATISTICS 1/

(Thousand metric tons, unless otherwise specified)

	1991	1992	1993	1994	1995
United States:					
Caustic-calcined and specified magnesias: 2/					
Shipped by producers: 3/					
Quantity	154	130	131	135	141
Value	thousands \$48,100	\$36,800	\$39,500	\$39,300	\$37,900
Exports 4/	4	5	4	3	2
Imports for consumption 4/	108	83	141	125	139
Refractory magnesia:					
Shipped by producers: 3/					
Quantity	296	291	268	243	234
Value	thousands \$85,300	\$80,800	\$77,700	\$67,800	\$83,800
Exports	66	57	60	60	75
Imports for consumption	147	210	279	342	393
Dead-burned dolomite:					
Sold and used by producers:					
Quantity	308	302	315	300	NA
Value	thousands \$25,700	\$25,200	\$26,200	\$25,000	NA
World production (magnesite)	9,790	9,990	8,050 r/	8,550 r/	9,170 e/

e/ Estimated. r/ Revised. NA Not available.

1/ Data are rounded to three significant digits.

2/ Excludes caustic-calcined magnesia used in the production of refractory magnesia.

3/ Includes magnesia used by producers.

4/ Caustic-calcined magnesia only.

TABLE 2
U.S. MAGNESIUM COMPOUND PRODUCERS, BY RAW MATERIAL
SOURCE, LOCATION, AND PRODUCTION CAPACITY, IN 1995

Raw material source and producing company	Location	Capacity (metric tons of MgO equivalent)	Products
Magnesite: Premier Services Inc.	Gabbs, NV	100,000	Caustic-calcined and dead-burned magnesia.
Lake brines:			
Great Salt Lake Minerals Corp.	Ogden, UT	94,000	Magnesium chloride and magnesium chloride brines.
Reilly Industries Inc.	Wendover, UT	45,000	Magnesium chloride brines.
Well brines:			
The Dow Chemical Co.	Ludington, MI	214,000	Magnesium hydroxide.
Martin Marietta Magnesia Specialties Inc.	Manistee, MI	275,000	Caustic-calcined and dead-burned magnesia.
Morton International	do.	10,000	Magnesium carbonate, magnesium hydroxide, and caustic-calcined magnesia.
Seawater:			
Barcroft Co.	Lewes, DE	5,000	Magnesium hydroxide.
The Dow Chemical Co.	Freeport, TX	20,000	Magnesium chloride.
National Refractories & Minerals Corp.	Moss Landing, CA	165,000	Magnesium hydroxide and caustic-calcined and dead-burned magnesia.
Premier Services Inc.	Port St. Joe, FL	50,000	Caustic-calcined and dead-burned magnesia.
Total		978,000	

TABLE 3
U.S. MAGNESIUM COMPOUNDS SHIPPED AND USED 1/

	1994		1995	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Caustic-calcined 2/ and specified (USP and technical) magnesia	135,000	\$39,300	141,000	\$37,900
Magnesium hydroxide [100% Mg (OH) 2] 2/	240,000	65,700	297,000	98,800
Magnesium sulfate (anhydrous and hydrous)	44,600	15,100	46,100	19,800
Precipitated magnesium carbonate 2/	2,470	534	3,070	735
Refractory magnesia	243,000	67,800	234,000	83,800

1/Data are rounded by the U.S. Geological Survey to three significant digits; may not add to totals shown.

2/ Excludes material produced as an intermediate step in the manufacture of other magnesium compounds.

TABLE 4
YEAREND MAGNESIUM COMPOUND PRICES

Material	Price
Magnesia, natural, technical, heavy, 85%, f.o.b. Nevada	per short ton \$232- \$265
Magnesia, natural, technical, heavy, 90%, f.o.b. Nevada	do. 265
Magnesia, dead-burned	do. 330
Magnesia, synthetic, technical	do. 366
Magnesium chloride, hydrous, 99%, flake	do. 290
Magnesium carbonate, light, technical (freight equalized)	per pound .73- .78
Magnesium sulfate, technical (epsom salts)	do. .16

Source: Chemical Marketing Reporter.

TABLE 5
U.S. EXPORTS OF CRUDE AND PROCESSED MAGNESITE, BY COUNTRY 1/

Material and country	1994		1995	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Caustic-calcined magnesia:				
Germany	458	\$304	302	\$166
Mexico	574	258	672	283
Netherlands	984	572	882	475
Venezuela	146	76	--	--
Other	1,080	573	423	271
Total	3,240	1,780	2,280	1,200
Dead-burned and fused magnesia:				
Canada	42,100	15,700	46,800	17,200
Germany	1,140	402	8,390	3,320
Israel	1,080	675	--	--
Netherlands	798	339	4,920	1,490
United Kingdom	2	4	6,510	2,630
Venezuela	7,750	2,530	4,120	1,360
Other	7,750	3,520	4,030	2,570
Total	60,600 r/	23,200 r/	74,800	28,600
Other magnesia:				
Canada	5,160	2,130	4,790	2,310
Hong Kong	650	119	698	806
Mexico	927	788	608	739
Venezuela	1,660	561	3,130	988
Other	4,820	5,060	3,150	3,460
Total	13,200 r/	8,660	12,400	8,310
Crude magnesite:				
Brazil	91	10	6,000	642
Canada	1,200	129	1,990	433
China	730	78	226	24
Germany	798	133	2,490	547
Korea, Republic of	3,830	410	6,620	716
Mexico	1,480	159	1,170	140
Netherlands	143	34	469	56
Venezuela	105	15	4,450	585
Other	1,180	177	8,490	980
Total	9,560 r/	1,150 r/	31,900	4,120

r/ Revised.

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

Source: Bureau of the Census.

TABLE 6
U.S. EXPORTS OF MAGNESIUM COMPOUNDS 1/

Material	1994		1995	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Magnesium chloride (anhydrous and other)	4,400	\$2,520	3,060	\$1,700
Magnesium hydroxide and peroxide	10,100	5,330	17,400	6,010
Magnesium sulfate (natural kieserite and epsom salts)	2,250	365	1,830	294
Magnesium sulfate (other)	4,160	2,210	4,740	1,830

1/ Data are rounded to three significant digits.

Source: Bureau of the Census.

TABLE 7
U.S. IMPORTS FOR CONSUMPTION OF CRUDE AND PROCESSED
MAGNESITE, BY COUNTRY 1/

Material and country	1994		1995	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Caustic-calcined magnesia:				
Canada	41,700	\$8,600	37,100	\$7,310
China	72,500	4,420	96,700	11,700
Greece	6,200	1,290	4,050	947
Other	4,770	1,770	843	1,250
Total	125,000	16,100	139,000	21,200
Dead-burned and fused magnesia:				
Australia	12,000	3,330	18,000	5,220
Austria	21,300	9,660	19,300	8,590
Brazil	3,400	388	15,000	1,720
China	264,000	20,900	321,000	46,100
Israel	10,600	5,060	2,690	2,540
Other	31,200 r/	12,500 r/	17,000	9,080
Total	342,000	51,800	393,000	73,200
Other magnesia:				
Israel	1,310	2,300	2,380	3,070
Japan	1,850	3,540	1,140	2,230
Mexico	3,070	1,150	7,530	2,640
Other	1,660 r/	1,510 r/	1,570	1,980
Total	7,890	8,500	12,600	9,930
Crude magnesite:				
Austria	92	33	18	6
China	53	26	693	294
Greece	20	2	3,450	466
Japan	99	20	227	45
Netherlands	17	13	9,080	3,450
Other	45 r/	39 r/	133	60
Total	326	133	13,600	4,320

r/ Revised.

1/ Data are rounded to three significant digits.

Source: Bureau of the Census.

TABLE 8
U.S. IMPORTS FOR CONSUMPTION OF MAGNESIUM COMPOUNDS 1/

Material	1994		1995	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Magnesium chloride (anhydrous and other)	23,100	\$5,820	16,500	\$4,780
Magnesium hydroxide and peroxide	2,790	4,700	4,940	9,550
Magnesium sulfate (natural kieserite)	19,600	1,080	27,400	1,510
Magnesium sulfate (natural epsom salts)	192	136	26	31
Magnesium sulfate (other)	9,790	1,940	16,000	3,360

1/ Data are rounded to three significant digits.

Source: Bureau of the Census.

TABLE 9
WORLD MAGNESIUM COMPOUNDS ANNUAL PRODUCTION CAPACITY 1/ 2/
DECEMBER 31, 1995

(Thousand metric tons, MgO equivalent)

Country	Raw material				Total
	Magnesite		Seawater or brines		
	Caustic-calcined	Dead-burned	Caustic-calcined	Dead-burned	
North America:					
Canada	100	--	--	--	100
Mexico	--	--	15	70	85
United States	NA	NA	NA	NA	978 3/
Total	100	NA	15	70	1,160
South America: Brazil					
	45	356	--	--	401
Europe:					
Austria	80	790	--	--	870
France	--	--	30	--	30
Greece	120	80	--	--	200
Ireland	--	--	--	90	90
Italy	25	--	5	130	160
Netherlands	--	--	--	100	100
Norway	--	--	25	--	25
Poland	--	10	--	--	10
Russia	--	2,220	--	--	2,220
Serbia and Montenegro	40	200	--	--	240
Slovakia	30	275	--	--	305
Spain	140	65	--	--	205
Turkey	50	259	--	--	309
Ukraine	--	--	20	80	100
United Kingdom	--	--	70	80	150
Total	485	3,900	150	480	5,020
Africa:					
Kenya	NA	NA	--	--	170
South Africa	7	--	--	--	7
Zimbabwe	NA	NA	--	--	2
Total	7	--	--	--	179
Asia:					
China	200	1,770	--	10	1,980
India	25	228	--	--	253
Iran	--	30	--	--	30
Israel	--	--	10	60	70
Japan	--	--	345	65	410
Korea, North	NA	NA	--	--	500
Korea, Republic of	--	--	--	50	50
Total	225	2,020	355	185	3,290
Oceania: Australia	137	40	--	--	177
Grand total	999	6,320	520	735	10,200

NA Not available.

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

2/ Includes capacity at operating plants as well as at plants on standby basis.

3/ Includes capacity for production of magnesium chloride, magnesium chloride brines, magnesium carbonate, magnesium hydroxide, and caustic-calcined and dead-burned magnesia.

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

(Metric tons)

Country	1991	1992	1993	1994	1995 e/
Australia e/	100,000	262,000	261,000	286,000 r/	280,000
Austria	960,589	995,347	648,864	681,000 r/	700,000
Brazil 3/ (beneficiated)	242,256	273,014	232,367	280,000 r/	280,000
Canada e/ 4/	180,000	180,000	180,000	180,000	180,000
China e/	1,650,000	1,510,000	1,230,000 r/	1,200,000 r/	1,200,000
Colombia	18,768	18,840	9,816	10,747 r/	10,000
Czechoslovakia 5/ 6/	328,000	XX	XX	XX	XX
Greece e/	590,188 7/	250,000	250,000	200,000	200,000
India	539,000 e/	602,506	408,971	333,368 r/	400,000
Iran 8/	29,291	36,165	49,424 r/	40,000 e/	40,000
Korea, North e/	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000
Mexico	600 e/	--	1,530	1,500 e/	1,550
Pakistan	5,191	6,484	4,157	4,000 e/	4,000
Philippines e/	700	700	700	700	700
Poland	8,100	12,900	13,000	16,400 r/	16,000
Russia e/ 9/	XX	1,100,000	800,000	700,000 r/	700,000
Serbia and Montenegro 10/	XX	185,000	55,000	68,000	75,000
Slovakia e/ 6/	XX	1,267,000 7/	1,200,000	1,200,000	1,200,000
South Africa	92,634	60,085	67,403	69,668	84,639 7/
Spain e/	445,000	400,000	400,000	400,000	400,000
Turkey (run of mine)	1,365,287	1,224,900	628,782	1,279,614 r/	1,800,000
U.S.S.R. e/ 9/ 11/	1,400,000	XX	XX	XX	XX
United States	W	W	W	W	W
Yugoslavia 10/ 12/	210,000	XX	XX	XX	XX
Zimbabwe	23,295	8,973	6,276	1,590 r/	1,500
Total	9,790,000	9,990,000	8,050,000 r/	8,550,000 r/	9,170,000

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

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

2/ Figures represent crude salable magnesite. In addition to the countries listed, Bulgaria produced magnesite, but output is not reported quantitatively, and available information is inadequate for formulation of reliable estimates of output levels. Table includes data available through June 21, 1996.

3/ Series reflects output of marketable concentrates. Production of crude ore was as follows, in tons: 1991--879,477; 1992--1,001,724; 1993--974,161; 1994--1,500,000 (revised); and 1995--1,500,000 (estimated).

4/ Magnesitic dolomite and brucite. Figures are estimated on the basis of reported tonnage dollar value.

5/ All production in Czechoslovakia for 1991-92 came from Slovakia.

6/ Dissolved on Dec. 31, 1992.

7/ Reported figure.

8/ Year beginning Mar. 21 of that stated. Includes 3,336 tons in 1991 and 220 tons in 1992 of huntite (Mg₃Ca(CO₃)₄), white clay.

9/ All production in U.S.S.R. for 1991 came from Russia.

10/ All production in Yugoslavia for 1991 came from Serbia and Montenegro.

11/ Dissolved in Dec. 1991.

12/ Dissolved in Apr. 1992.