

# MAGNESIUM COMPOUNDS

By Deborah A. Kramer

Increased use of magnesia in water treatment applications and reduced imports of dead-burned magnesia from China were primarily responsible for the overall increase in U.S. production of magnesium compounds in 1996. Although U.S. production increased, apparent consumption declined; the increase in domestic dead-burned magnesia production did not completely replace the drop in imports of Chinese dead-burned magnesia. China remained the largest U.S. import source of magnesia, but with the export licensing and quota system that was established in 1994, imports in 1996 decreased by more than 100,000 metric tons from the 1995 level. Refractories were the principal use of magnesia in the United States, accounting for 64% of total magnesium compounds consumption. U.S. firms planned to expand production of dead-burned magnesia, and a new magnesium hydroxide plant was completed to help meet demand for this material in water treatment applications.

## Production

U.S. production of caustic-calcined magnesia, dead-burned magnesia, and magnesium hydroxide increased in 1996. Increased caustic-calcined magnesia production principally was the result of increased consumption of this material in acid neutralization applications, mostly water treatment. Magnesium hydroxide production increased to supply dead-burned magnesia production and also because of increased usage in water treatment applications. Dead-burned magnesia production increased partially to replace the loss of imported material from China.

Harbison-Walker Refractories Inc. installed a fifth shaft kiln for producing dead-burned magnesia at its Ludington, MI, facility. The new kiln, which was operational in August, will increase the company's total annual production capacity from 150,000 tons to 200,000 tons. Harbison-Walker also is expanding its magnesium hydroxide filtration unit to accommodate the increased production capacity (Industrial Minerals, 1996e).

Martin Marietta Magnesia Specialties Inc. completed a 15,000-ton-per-year magnesium hydroxide plant in Lenoir City, TN, in the fourth quarter. This new plant complements the company's magnesium hydroxide production capacity in Manistee, MI, (80,000 tons per year) and Pittsburgh, PA (30,000 tons per year). The Tennessee and Pennsylvania plants recover magnesium hydroxide from imported Chinese magnesite, while the Michigan plant uses underground brines as a raw material. Magnesium hydroxide produced at the new facility was expected to be used for water treatment (Chemical Market Reporter, 1996). Lockheed Martin Corp., the parent

company of Martin Marietta Magnesia Specialties, announced that it would divest its 81% interest in the subsidiary to concentrate on its aerospace and defense markets. In October, Lockheed Martin began an exchange offer that would give shareholders a chance to exchange 4.72 shares of Martin Marietta Materials for 1 share of Lockheed Martin common stock (North American Mineral News, 1996).

Premier Services Corp., the sole magnesite producer in the United States purchased additional mining equipment that the company says will double magnesite mining capacity at its Gabbs, NV, mine. Premier Services produces caustic-calcined and dead-burned magnesia from the mined magnesite using multiple-hearth and rotary kilns. (*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 58% 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. (*See table 3.*)

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 60% of the world magnesite production capacity. Japan and the United States account for 57% of the world's magnesium compounds production capacity from seawater or brines. Fused magnesia is produced in Australia, Brazil, Canada, China, France, Israel, Japan, the Republic of Korea, Mexico, the United Kingdom, and the United States. A review of the world fused magnesia industry was published in January (O'Driscoll, 1996).

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 Australia, Italy, Japan, Mexico, Pakistan, Spain, and the United States.

## Consumption

In 1996, chemical applications were the dominant use for caustic-calcined magnesia, accounting for 45% 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), 11%; manufacturing (pulp and paper, rubber, fluxes, and fuel additives), 8%; construction (oxychloride and oxysulfate cements and general construction), 4%; pharmaceuticals and nutrition (cosmetics, sugar, candies and other food items, and medicinal and pharmaceutical), 4%; and unspecified uses, 1%. Water treatment continued to exhibit significant market growth; it 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 refractories and for road dust and ice control.

Foundry uses remained the largest application for olivine in the United States, accounting for 79% of consumption of domestically produced material. Refractory applications accounted for 14% of U.S. demand, sandblasting and other abrasive uses accounted for 6%, and soil conditioners accounted for 1%.

## Prices

Yearend magnesium compounds prices quoted in Chemical Marketing Reporter did not change from those at yearend 1995. 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 1995. All prices were quoted f.o.b. mine or plant. (See table 4.)

## Foreign Trade

Because of export licensing requirements, U.S. imports of magnesia from China fell for the first time in 7 years; however, China remained the principal import source for caustic-calcined and dead-burned and fused magnesia. (See tables 5, 6, 7, and 8.)

Trade data for olivine is not available separately from the Bureau of the Census. The Journal of Commerce Port Import/Export Reporting Service provides data on material that travels by ship. In 1996, the United States exported 488 tons of olivine, with the Republic of Korea (25%) and Chile (25%) as the principal destinations. Olivine imports totaled 176,000 tons of olivine, all from Norway.

## World Review

**Australia.**—Queensland Metals Corp. (QMC) purchased Pancontinental Resources Pty. Ltd.'s 40% ownership of the Queensland Magnesia Project (QMAG) for A\$63 million. The deal gives QMC 100% ownership in QMAG. QMC plans to install ore sorting capabilities at the Kunwarara magnesite mine and expand capacity for producing fused and dead-burned magnesia with a A\$28 million investment. Production capacity

for fused magnesia will be increased by 33% to 40,000 tons per year, and capacity for dead-burned magnesia production will be increased by 50% to 120,000 tons per year. The new capacity was expected to be operational by mid-1997 (Queensland Metals Corp., 1996). In October, QMC completed a 25,000-ton-per-year magnesium hydroxide slurry plant in Melbourne, with ICI Australia, QMC's joint-venture partner, providing one-half of the financing. By yearend, plant trials had begun (Industrial Minerals, 1996a).

Devex Ltd. announced that it would sell Causmag Ore Pty. Ltd., its magnesia subsidiary, to concentrate on its gold mining business. Causmag, which operates caustic-calcined magnesia production facilities in Young, New South Wales, had recently completed a feasibility study for the production of fused magnesia and was planning to build a 10,000-ton-per-year plant. These plans were expected to be unsettled until the sale of Causmag is finalized; at yearend, there were no buyers for the operation (Industrial Minerals, 1996b).

**Brazil.**—Magnesita S.A., Brazil's largest magnesite producer, was expanding into caustic-calcined magnesia production. The company installed a 30,000-ton-per-year kiln to increase production capacity for caustic-calcined magnesia to 70,000 tons per year; the new kiln is expected to be operational by March 1997. Markets for caustic-calcined magnesia in Brazil include slag control, fertilizers, cement, abrasives, and magnesia salts (Kendall, 1996).

**China.**—The Chinese Government instituted a set of new policies to combat reported cases of magnesite smuggling, which have been estimated to amount to 200,000 tons to 300,000 tons in a year. The new policies specify specific ports that can export magnesia products and include mineral products containing at least 70% MgO. These policies also are designed to question exports that are designated by other mineral names, such as wollastonite, dolomite, and brucite. Illegal exports of magnesite, as well as bauxite and fluorspar, are occurring because of the export licensing procedures (Industrial Minerals, 1996c). In November, the Chinese Government issued a list of 18 companies that have negotiated bidding rights for magnesite export licenses for 1997 and specified the official export quota for 1997 as 2 million tons (Industrial Minerals, 1996d).

**France.**—Pechiney Electrometallurgie announced that it would discontinue production of fused magnesia and fused spinel by the end of April 1996 (Industrial Minerals, 1996g). Pechiney operated a 10,000-ton-per-year plant at Chedde, Haute-Savoies, which was under negotiation for acquisition by Universal Ceramic Minerals plc (UCM) of the United Kingdom. In January, UCM announced that the negotiations for the plant were terminated. Pechiney planned to sue UCM for Ffr20 million for undertaking the negotiations in "bad faith." Pechiney claimed that UCM terminated the negotiations after acquiring considerable technical knowledge about the operation at Chedde (Industrial Minerals, 1996h).

**India.**—An Indian refractories manufacturer announced that it was considering building a 10,000-ton-per-year fused magnesia-alumina spinel plant near existing operations in Bihar. One of the reasons for establishing domestic production of this

material is the high duties on refractory products; low-value raw materials can be imported more economically. No timetable was established for plant construction (Industrial Minerals, 1996i). Work was continuing on India's first seawater magnesia plant, and Birla Periclase, a subsidiary of Aditya Birla Group Co., expected production to begin by the end of 1996.

**Italy.**—In January, Sardamag SpA sold its 20% participation in Nuova Sardamag Srl to Sigma Investimenti SpA, a holding company for the Sardinian regional government that owned the remaining 80%. Sardamag operates a 75,000-ton-per-year seawater magnesia plant in Sicily and Nuova Sardamag operates a 60,000-ton-per-year seawater magnesia plant in Sardinia. Sardamag will continue to purchase and resell material produced by Nuova Sardamag (Industrial Minerals, 1996f).

**Slovakia.**—In March, Greenpeace, the international environmental organization, reportedly was pressuring the Kocise Magnesite State Enterprise to close its calcining operation because of blowing dust from the plant. The plant is due to be replaced by a new facility about 15 kilometers outside Kocise, but the plant would not be ready for commissioning for at least 6 months. The company wanted to keep the older plant operating until the new one was ready, but the environmental group felt that this was too long (Industrial Minerals, 1996k).

**United Kingdom.**—UCM announced plans to expand its fused magnesia plant at Hull. By the end of the fourth quarter, the company expected to commission a 12,000-ton-per-year expansion to its subsidiary Electro Furnace Products Ltd. With closures in France and Germany in 1996, UCM was strengthening its position as the world largest fused magnesia producer. With the additional capacity, UCM's total annual capacity will be about 37,000 tons, including capacity from a plant in the United States (Industrial Minerals, 1996j). (*See tables 9 and 10.*)

## Outlook

With the reduced supplies of dead-burned magnesia from China and capacity expansions at U.S. plants, domestic production of dead-burned magnesia is likely to increase in the next few years. Continued strong demand for magnesium hydroxide and caustic-calcined magnesia for acid neutralization applications is likely to boost domestic production of these materials as well. Overall consumption of magnesium compounds is expected to remain at about the same level as 1996, but demand for magnesia for uses other than refractories is expected to grow; therefore, refractories, while still the largest end use for magnesia, are expected to reflect a smaller percentage of the total market.

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TABLE 1  
SALIENT MAGNESIUM COMPOUND STATISTICS 1/

(Thousand metric tons, unless otherwise specified)

	1992	1993	1994	1995	1996
United States:					
Caustic-calcined and specified magnesias: 2/					
Shipped by producers: 3/					
Quantity	130	131	135	141	158
Value	thousands \$36,800	\$39,500	\$39,300	\$37,900	\$47,600
Exports 4/	5	4	3	2	20
Imports for consumption 4/	83	141	125	139	114
Refractory magnesia:					
Shipped by producers: 3/					
Quantity	291	268	243	234	269
Value	thousands \$80,800	\$77,700	\$67,800	\$83,800	\$96,800
Exports	57	60	60	75	73
Imports for consumption	210	279	342	393	271
Dead-burned dolomite:					
Sold and used by producers:					
Quantity	302	315	300	308	NA
Value	thousands \$25,200	\$26,200	\$25,000	\$28,100	NA
World production (magnesite)	10,200 r/	8,280 r/	8,720 r/	9,940 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 1996

Raw material source and producing company	Location	Capacity (metric tons of MgO equivalent) 1/	Products
Magnesite: Premier Services Inc.	Gabbs, NV	100,000	Caustic-calcined and dead-burned magnesia.
Lake brines:			
Great Salt Lake Minerals Corp.	Ogden, UT	106,000	Magnesium chloride and magnesium chloride brines.
Reilly Industries Inc.	Wendover, UT	45,000	Magnesium chloride brines.
Well brines:			
The Dow Chemical Co. 2/	Ludington, MI	214,000	Magnesium hydroxide.
Martin Marietta Magnesia Specialties Inc. 3/	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		990,000	

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

2/ Most of Dow's production is shipped to Harbison-Walker Refractories Co. in Ludington, MI, where it is converted to dead-burned magnesia at a 200,000-ton-per-year plant.

3/ In addition to its Michigan plant, Martin Marietta owns a 30,000-ton-per-year magnesium hydroxide plant in Pittsburgh, PA, and a 15,000-ton-per-year magnesium hydroxide plant in Lenoir City, TN, which use imported magnesite as a raw material.

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

	1995		1996	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Caustic-calcined 2/ and specified (USP and technical) magnesias	141,000	\$37,900	158,000	\$47,600
Magnesium hydroxide [100% Mg (OH)2] 2/	297,000	98,800	338,000	112,000
Magnesium sulfate (anhydrous and hydrous)	46,100	19,800	45,600	19,500
Precipitated magnesium carbonate 2/	3,070	735	2,960	726
Refractory magnesia	234,000	83,800	269,000	96,800

1/ Data are rounded to three significant digits.

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	1995		1996	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
<b>Caustic-calcined magnesia:</b>				
France	107	\$72	1,480	\$1,070
Germany	302	166	14,300	4,360
Mexico	672	283	1,220	340
Netherlands	882	475	690	379
Spain	--	--	1,700	510
Other	316 r/	199 r/	208	113
<b>Total</b>	<b>2,280</b>	<b>1,200</b>	<b>19,600</b>	<b>6,770</b>
<b>Dead-burned and fused magnesia:</b>				
Canada	46,800	17,200	42,500	15,600
Germany	8,390	3,320	8,890	2,750
Netherlands	4,920	1,490	7,190	2,300
Switzerland	--	--	5,520	1,660
United Kingdom	6,510	2,630	2,180	1,220
Venezuela	4,120	1,360	2,910	945
Other	4,030	2,570	3,380	3,040
<b>Total</b>	<b>74,800</b>	<b>28,600</b>	<b>72,600</b>	<b>27,500</b>
<b>Other magnesia:</b>				
Canada	4,790	2,310	5,450	2,640
China	398	244	1,320	480
Colombia	193	320	1,450	539
Mexico	608	739	2,680	1,770
Spain	420	495	1,050	1,320
United Kingdom	84	103	1,470	1,870
Venezuela	3,130	988	--	--
Other	2,750 r/	3,110 r/	3,130	3,910
<b>Total</b>	<b>12,400</b>	<b>8,300</b>	<b>16,600</b>	<b>12,500</b>
<b>Crude magnesite:</b>				
Brazil	6,000	642	5,220	558
Canada	1,990	433	1,040	258
France	30	3	4,390	623
Germany	2,490	547	1,580	342
Korea, Republic of	6,620	716	5,340	621
Mexico	1,170	140	5,000	586
Venezuela	4,450	585	5,170	587
Other	9,160 r/	1,060 r/	5,270	669
<b>Total</b>	<b>31,900</b>	<b>4,120</b>	<b>33,000</b>	<b>4,240</b>

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	1995		1996	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Magnesium chloride, anhydrous and other	3,060	\$1,700	3,630	\$2,750
Magnesium hydroxide and peroxide	17,400	6,010	12,200	6,560
Magnesium sulfate, natural kieserite and epsom salts	1,830	294	6,750	877
Magnesium sulfate, other	4,740	1,830	5,030	1,810

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	1995		1996	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
<b>Caustic-calcined magnesia:</b>				
Canada	37,100	\$7,310	37,300	\$7,810
China	96,700	11,700	63,700	6,870
Greece	4,050	947	10,500	2,580
Other	843	1,250	2,700	1,940
<b>Total</b>	<b>139,000</b>	<b>21,200</b>	<b>114,000</b>	<b>19,200</b>
<b>Dead-burned and fused magnesia:</b>				
Australia	18,000	5,220	12,100	3,620
Austria	19,300	8,590	21,000	9,530
Brazil	15,000	1,720	10,000	1,190
China	321,000	46,100	193,000	30,100
Greece	3,310	770	5,710	911
Slovakia	--	--	9,010	1,020
Other	16,300 r/	10,800 r/	20,500	11,300
<b>Total</b>	<b>393,000</b>	<b>73,200</b>	<b>271,000</b>	<b>57,600</b>
<b>Other magnesia:</b>				
China	132	93	2,520	944
Israel	2,380	3,070	2,790	3,450
Japan	1,140	2,230	973	1,810
Mexico	7,530	2,640	4,100	1,570
Other	1,440 r/	1,890 r/	1,470	1,270
<b>Total</b>	<b>12,600</b>	<b>9,930</b>	<b>11,900</b>	<b>9,040</b>
<b>Crude magnesite:</b>				
China	693	294	5,290	441
Greece	3,450	466	153	24
Netherlands	9,080	3,450	3,610	1,370
Other	378 r/	111 r/	129	59
<b>Total</b>	<b>13,600</b>	<b>4,320</b>	<b>9,190</b>	<b>1,900</b>

r/ Revised.

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

Source: Bureau of the Census.

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

	1995		1996	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Magnesium chloride, anhydrous and other	16,500	\$4,780	21,500	\$5,600
Magnesium hydroxide and peroxide	4,940	9,550	4,310	7,590
Magnesium sulfate, natural kieserite	27,400	1,510	18,700	1,120
Magnesium sulfate, natural epsom salts	26	31	24	23
Magnesium sulfate, other	16,000	3,360	20,200	4,260

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, 1996

(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	95	110
United States	NA	NA	NA	NA	990 3/
Total	100	NA	15	95	1,200
South America: Brazil					
	58	291	--	--	349
Europe:					
Austria	80	485	--	--	565
France	--	--	30	--	30
Greece	120	80	--	--	200
Ireland	--	--	--	90	90
Italy	25	--	5	130	160
Netherlands	--	--	--	130	130
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	279	--	--	329
Ukraine	--	120	20	80	220
United Kingdom	--	--	70	80	150
Total	485	3,740	150	510	4,880
Africa:					
Kenya	NA	NA	--	--	170
South Africa	7	--	--	--	7
Total	7	NA	--	--	177
Asia:					
China	200	1,770	--	10	1,980
India	25	246	--	--	271
Iran	--	30	--	--	30
Israel	--	--	10	60	70
Japan	--	--	65	265	330
Korea, North	NA	NA	--	--	500
Korea, Republic of	--	--	--	50	50
Total	225	2,040	75	385	3,230
Oceania: Australia					
	40	107	--	--	147
Grand total	915	6,180	240	990	9,980

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	1992	1993	1994	1995	1996 e/
Australia e/	262,000	260,600	286,000 r/	263,000 r/	290,000
Austria	995,347	648,864	681,000	784,000 r/	700,000
Brazil 3/ (beneficiated)	273,014	232,367	279,251 r/	318,745 r/	320,000
Canada e/ 4/	180,000	180,000	180,000	180,000	180,000
China e/	1,510,000	1,230,000	990,000 r/	1,200,000	1,000,000
Colombia	18,840	8,816	10,747	10,000 e/	10,000
Czechoslovakia 5/	1,267,000	XX	XX	XX	XX
Greece	471,200 r/	479,999 r/	575,472 r/	520,000 r/ e/	500,000
India	602,506	408,971	336,735 r/	334,710 r/	335,000
Iran 6/	36,165	49,424	40,000 e/	40,000 e/	40,000
Korea, North e/	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000
Mexico	--	1,530	1,500 e/	1,200 r/ e/	1,300
Pakistan	6,484	4,157	4,464 r/	16,891 r/	17,000
Philippines e/	700	700	700	700	700
Poland	12,900	13,000	16,400	21,500 r/	20,000
Russia e/	1,100,000	800,000	700,000	700,000	600,000
Serbia and Montenegro	185,000	55,000	68,000	75,000 e/	75,000
Slovakia e/ 7/	XX	1,200,000	1,200,000	1,200,000	1,000,000
South Africa	60,085	67,403	71,726 r/	84,289 r/	71,500
Spain e/	400,000	400,000	400,000	400,000	400,000
Turkey (run of mine)	1,224,900	628,782	1,279,614	2,184,681 r/	2,000,000
United States	W	W	W	W	W
Zimbabwe	8,973	6,276	1,588 r/	8,199 r/	8,000
Total	10,200,000 r/	8,280,000 r/	8,720,000 r/	9,940,000 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 May 20, 1997.

3/ Series reflect output of marketable concentrates. Production of crude ore was as follows, in tons: 1992--1,001,724; 1993--974,161; 1994--1,019,688 (revised); 1995--1,230,955 (revised); and 1996--1,200,000 (estimated).

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

5/ Dissolved on Dec. 31, 1992. All production for Czechoslovakia in 1992 came from Slovakia.

6/ Year beginning Mar. 21 of that stated. Includes 220 tons in 1992 of huntite (Mg<sub>3</sub>Ca(CO<sub>3</sub>)<sub>4</sub>), white clay.

7/ Formerly part of Czechoslovakia; data were not reported separately until 1993.