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MAGNESIUM COMPOUNDS

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MAGNESIUM COMPOUNDS

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Domestic production of caustic-calcined magnesia and dead-burned magnesia in 2006 declined from those 2005, and imports continued to account for most of the U.S. consumption of magnesia. Consumption of refractory magnesia was about 7% less than that in 2005; imports continued to account for most of the consumption. Caustic-calcined (and other) magnesia consumption decreased slightly, with imports accounting for about 57% of total U.S. consumption. In contrast to the production of other magnesium compounds, the production of magnesium hydroxide increased. The principal reason for the production increase was an increase in consumption for environmental applications.

About 61% of U.S. magnesium compounds production came from seawater and well and lake brines. The remainder was recovered from brucite, dolomite, magnesite, and olivine. About 59% of the total consumption of magnesium compounds was for refractory applications. The remaining 41% was used in agricultural, chemical, environmental, and other applications. China (including Hong Kong) remained the dominant supplier of imports for refractory (dead-burned and fused) and caustic-calcined magnesias with 83% and 86%, respectively, of the totals.

Production

Shipments of most magnesium compounds declined in 2006, with the exception of magnesium hydroxide (table 3). Increased use of magnesium hydroxide in environmental applications was partially responsible for the increase in production of magnesium hydroxide.

Data for magnesium compounds were collected by the U.S. Geological Survey from one voluntary survey of U.S. operations. Of the 16 operations canvassed, 75% responded, representing 70% of the magnesium compounds shipped and used, including data for some compounds that were not reportable in table 3. Data for the four nonrespondents were estimated on the basis of prior-year consumption levels.

The largest capacity magnesite processing facilities in the world are in China, North Korea, and Russia. Together, these three countries accounted for two-thirds of the world magnesite production capacity. Japan and the United States accounted for about one-half of the world's magnesium compounds production capacity from seawater or brines. Fused magnesia was produced in Australia, Brazil, Canada, China, Israel, Japan, the Republic of Korea, Mexico, Russia, the United Kingdom, and the United States. World production capacity was estimated to be about 560,000 metric tons per year (t/yr), including about 372,000 t/yr of capacity in China (Schroeder, 2006).

Fused magnesia was produced by two companies in the United States—Minco Inc. with a plant in Midway, TN, and UCM Group PLC of the United Kingdom, which operated a plant in Cherokee, AL, through its Muscle Shoals Minerals Inc. subsidiary.

Norway is the world's principal producer and supplier of olivine. Other producers include Australia, Austria, Brazil, China, Denmark (Greenland), Greece, Italy, Japan, the Republic of Korea, Mexico, Spain, Taiwan, Turkey, and the United States. Rudi (2001) estimated that total world production of olivine averaged about 4 million metric tons per year (Mt/yr), with about 3.3 Mt/yr consumed in Europe. An additional 4 Mt/yr of dunite and serpentinite that is often commercially called olivine is produced. One company in the United States produced olivine—Olivine Corp., which operated a mine and processing plant in Washington.

Martin Marietta Magnesia Specialties LLC announced that it would nearly double production capacity for magnesium hydroxide at its Manistee, MI, plant to more than 50,000 t/yr by yearend 2007. Martin Marietta increased its production capacity because of an expected increase in magnesium hydroxide powder consumption in the flame retardant market and changes in the building and construction markets (Industrial Minerals, 2006d).

In January, Minco sold its fused magnesia operations in Midway, TN, to Mexican producer Industrias Peñoles S.A., but to avoid disruptions to its customers, maintained operations in the United States until May. Peñoles planned to move the 20,000-t/yr fused magnesia plant to its facility in Ramos Arizpe, Coahuila, Mexico. Minco sold the plant because most of its customers for electrical-grade fused magnesia were in Asia and Mexico. Minco had been importing caustic-calcined magnesia feed from Australia and Greece, and then shipping its product over similar distances, which the company felt did not make sense economically (O'Driscoll, 2006a).

Consumption

In 2006, environmental applications (water treatment and stack-gas scrubbing, in descending order) were the largest tonnage end use for caustic-calcined magnesia, with 35% of the total. Chemical applications was the second largest end use, with 28% of the total. The following categories, with the individual components in descending order of consumption in parentheses, were the other end-use sectors for caustic-calcined magnesia: agriculture (animal feed and fertilizers), 24%; manufacturing (fluxes, rubber, and electrical), 8%; construction (primarily oxychloride and oxysulfate cements), 5%; pharmaceuticals and nutrition and unspecified uses, each less than 1%.

Magnesium hydroxide was used mainly for water treatment, as a chemical intermediate, and in medicines and pharmaceuticals (uses are given in descending order of

quantity). Smaller applications for magnesium hydroxide were in the construction industry, in rubber processing, and in pharmaceuticals. Magnesium sulfate was used mostly for chemical, fertilizer, pulp and paper, pharmaceutical, rubber, water treatment, construction, and cosmetics applications (in descending order of quantity). Magnesium chloride was used mainly for ice control. Magnesium chloride brines were used for road dust and ice control.

Prices

At the end of August, Chemical Market Reporter changed its name to ICIS Business Americas and stopped publishing prices for magnesium compounds. The last prices published, as of August 28, 2006, are listed in table 4 and did not change appreciably from those at yearend 2005.

Foreign Trade

In 2006, dead-burned magnesia exports were 20% less than those in 2005 (table 5). Canada (81%) was the principal destination. Caustic-calcined magnesia exports increased by 16% from those in 2005. France (32%) and the Netherlands and Venezuela (26% each) were the main destinations.

Imports of dead-burned magnesia were about 9% less than those in 2005, with imports from China representing 83% of the total (table 7). Imports of caustic-calcined magnesia were about 7% higher than those in 2005. China, including Hong Kong (86%) and Canada (11%) were the primary sources.

Trade data for olivine are not available separately from the U.S. Census Bureau. The Journal of Commerce Port Import/Export Reporting Service (PIERS), however, provides data on material that travels by ship. U.S. exports of olivine were 380 metric tons (t) in 2006. Venezuela (91%) and Taiwan (9%) were the destinations. U.S. olivine imports were 172,000 t, 17% higher than those in 2005. Norway (95%) and Greenland (5%) were the sources of almost all United States olivine imports.

World Review

European Union.—In May, the European Commission (EC) extended the antidumping duty on imports of dead-burned magnesia from China that was established in 2000, with a minimum import price of €120 per metric ton. The duty had expired in January 2005, but the EC had begun a review in February 2005 that investigated market activity in calendar year 2004. As a result of its investigation, the EC concluded that prices for Chinese dead-burned magnesia had fallen by 10% in 2004 compared with those in 2003, and had fallen by 24% from 2001–04. Therefore, the EC felt that these trends would continue without an imposition of the duty (Industrial Minerals, 2006a).

China.—RHI AG of Germany signed a joint venture with Liaoning Jinding Magnesite Group Co. Ltd. to construct a new dead-burned and fused magnesia production plant to supply RHI's magnesia-base refractory plants in Bayuquan and Dailan in Liaoning Province. Construction of the new 100,000-t/yr plant began in mid-2006, with the first line scheduled to be onstream in mid-2007. RHI would own 80% of the new company, Liaoning RHI Jinding Magnesite Co. Ltd., and its partner would own the remaining 20%. Liaoning Jinding Magnesite Group owned two magnesite mines in Lioaning Province that were expected to supply the new plant with its raw material needs (O'Driscoll, 2006b). RHI also announced that it would increase the production capacity for fired magnesia bricks at its Dalian plant by 35,000 t/yr, bringing the total capacity at the plant to 75,000 t/yr. The expansion was expected to be completed by 2007 (RHI AG, 2006).

Hong Kong Great Wall Trading Development Ltd. announced that it purchased an open pit magnesite mine at Xiuyan, Liaoning Province, close to the border with North Korea. The mine is east of the principal mining areas in Liaoning Province and has installed capacity of 100,000 t/yr of caustic-calcined magnesia production. The company began operating the calcining plant in February (Industrial Minerals, 2006b).

Several firms completed new magnesia-base refractories plants in China in 2006. Tata Refractories Ltd. of India constructed a 30,000-t/yr plant to produce magnesia-carbon bricks, which was scheduled to be commissioned in January 2007 (Industrial Minerals, 2006e). In September, Polish firm Zaklady Magnetowe "Ropczyce" S.A. completed a 45,000-t/yr magnesia-carbon refractories plant in Haicheng, Liaoning Province. This plant is a 50-50 joint venture with Liaoning Xinrong Minerals Group Co. Ltd., which produced magnesia products at its six plants in Liaoning Province (O'Driscoll, 2006c). By locating the refractories plants in China, the foreign companies have significant supplies of magnesite and can sell the products to China's growing steel industry.

Price increases, an export tax, and city feuds were complicating magnesite supplies in China. In December, the four principal producers of magnesite in China agreed on a $10-per-metric-ton price increase for their dead-burned magnesia grades. This followed $30-per-metric-ton price increases that were announced in November. In addition, the central Government was expected to impose a new export tax of 10% on magnesia, effective January 1, 2007. Reflecting the Chinese Government's policy of protecting the country's mineral resources by limiting exports, the city of Haicheng decided to limit the quantity of magnesite leaving the city. This would cause supply constraints on the nearby city of Dashiqiao, which relies on magnesite supplied by Haicheng for its fused magnesia production, as well as for overseas customers (O'Driscoll, 2007).

Israel.—Following a reorganization at Israel Chemicals Ltd., Dead Sea Periclase became Magnesia Products SBU of ICL-Industrial Products and decided to stop producing dead-burned magnesia. Prior to this decision, the company was producing only small quantities of high-purity dead-burned magnesia for niche applications. Competition from Chinese dead-burned magnesia was cited as the principal reason for the decision. The company planned to concentrate on its production of specialty caustic-calcined magnesia, which was used by the pharmaceuticals, food, transformer steel, rubber, and plastics industries (Mureinik, 2006).

Jordan.—According to a report from the Prime Minster's office, in June, the cabinet referred the case of the Jordan Magnesia Co. to the prosecutor general to "take the necessary legal measures over alleged corruption" in the firm. The

company's financial losses were estimated at $185 million (Jordan Information Office, 2006). Jordan Magnesia completed a 60,000-t/yr magnesia plant at Al-Safi at the end of 2002, but the plant has not operated since December 2004.

Russia.—The country's leading magnesite producer, Magnezit Group, started developing the Goluboye magnesite deposit in late August, and planned to begin producing caustic-calcined magnesia from the magnesite in the deposit by early 2007. The company reported that explored reserves of the Goluboye deposit were 15.5 million metric tons (Mt), but this figure may increase after additional exploration work is completed. Magnezit planned to build a 95,000-t/yr caustic-calcined magnesia plant, of which 62,000 t/yr would be used as feedstock for a new fused magnesia plant that the company planned to construct, and 33,000 t/yr would be sold (Industrial Minerals, 2006c).

Serbia.—The Kosovo Trust Agency postponed the privatization of the area's two magnesite mines, XIM Strezoc Magnesite Mine and Goleshi Magnesite Mine. The new date for the first bids was set for March 7, 2007, with more lenient prequalification conditions. The Strezoc Mine was estimated to contain between 4.5 and 5.5 Mt of magnesite, which included higher grade ore reserves of 1.5 to 1.7 Mt. The reserves at the Goleshi Mine were estimated to be 2.4 Mt of medium- to high-grade magnesite. Although both operations produced dead-burned and caustic-calcined magnesia prior to the Balkan conflict in the early 1990s, neither had been producing since the early 2000s (Kosovo Trust Agency, 2006).

Outlook

According to the International Iron and Steel Institute (ISII) (2007), world steel production in 2006 increased by 8.8% from that in 2005 to reach the highest level of crude steel output in history. Production in China, the leading producer, increased by almost 18% and represented nearly 34% of total world production. In its medium-term forecast, ISII projected that steel use in China would continue to grow, but at a more moderate rate than in the past, resulting from stronger credit control and administrative measures introduced by the Chinese authorities (International Iron and Steel Institute, 2006). Increased iron and steel production in China could lead to more internal consumption of refractories (including magnesia-base refractories), which would mean that less material would be available for export. Because the United States has lost much of its refractory magnesia production capacity in recent years and China is the principal United States supplier, a shortage of supply in the United States is possible. China, however, has vast resources of magnesite, and could increase magnesite production capacity to meet its internal and export needs.

In a review of the world magnesia refractories industry, Drnek (2006) estimated that although the quantity of refractories used per ton of steel produced has decreased from 1994–2004, the quantity of magnesia-base refractories used per ton of steel produced has increased. Total refractories consumption has declined to 14.5 kilograms per metric ton (kg/t) of steel produced in 2004 from 21.6 kg/t in 1994, but magnesia-base refractories use has increased to 4.6 kg/t from 3.9 kg/t during the same time period. Use of refractories in cement has followed a similar trend, with use of magnesia-base refractories estimated to have increased by 0.3 t from 1994–2004. Drnek projected that this trend will continue—overall declining refractories consumption in the steel and cement industries, but because of increased production and changes in furnace linings, magnesia-base refractories use will increase.

Caustic-calcined magnesia markets are fairly mature, but use of magnesium hydroxide for environmental applications is growing. Because of its superior properties, magnesium hydroxide is expected to continue to replace such material as lime and caustic soda in some environmental applications. In addition, the use of magnesium hydroxide as a flame retardant material in specialized wire and cable applications could present an area for growth.

References Cited

Drnek, Thomas, 2006, Magnesia in refractories: Industrial Minerals, no. 462, March, p. 84-87.

Industrial Minerals, 2006a, EC proposes to maintain Chinese DBM antidumping duties: Industrial Minerals, no. 465, June, p. 9.

Industrial Minerals, 2006b, Great Wall buys magnesite/talc mines while Normag expands: Industrial Minerals, no. 462, March, p. 9.

Industrial Minerals, 2006c, Magnezit develops new deposit: Industrial Minerals, no. 469, October, p. 6.

Industrial Minerals, 2006d, Martin Marietta expands $Mg(OH)_2$ capacity: Industrial Minerals, no. 465, June, p. 8-9.

Industrial Minerals, 2006e, Tata Refractories plant in China: Industrial Minerals, no. 470, November, p. 27.

International Iron and Steel Institute, 2006, Short range outlook and medium term forecast: International Iron and Steel Institute. (Accessed February 27, 2007, at http://www.worldsteel.org/?action=newsdetail&id=175.)

International Iron and Steel Institute, 2007, World produces 1,239.5 mmt of crude steel in 2006: International Iron and Steel Institute. (Accessed February 27, 2007, at http://www.worldsteel.org/?action=newsdetail&id=182.)

Jordan Information Office, 2006, JORMAG case referred to prosecutor general: Jordan Information Office. (Accessed February 28, 2007, at http://www.jordan.jo/en/en-PM/wmview.php?ArtID=345.)

Kosovo Trust Agency, 2006, Kosovo Trust Agency launches 22nd wave of privatization: Pristine, Kosovo, Kosovo Trust Agency. (Accessed February 22, 2007, at http://kta-kosovo.org/ktapress/2006/eng/launch-of-wave-22-eng.pdf.)

Mureinik, Ronald, 2006, Magnesia market evolution: Industrial Minerals, no. 642, March, p. 70-73.

O'Driscoll, Mike, 2006a, Minco exits fused magnesia: Industrial Minerals, no. 465, June, p. 6-7.

O'Driscoll, Mike, 2006b, RHI signs Chinese magnesia j-v: Industrial Minerals, no. 456, May, p. 6-7.

O'Driscoll, Mike, 2006c, Ropczyce goes east: Industrial Minerals, no. 470, November, p. 28-31.

O'Driscoll, Mike, 2007, Magnesia mayhem in Liaoning: Industrial Minerals, no. 472, January, p. 8.

RHI AG, 2006, RHI Refractories extends refractories capacity in China further: RHI AG. (Accessed February 1, 2007, at http://www.rhi-ag.com/internet/en/corpsvc/ir/All_20News/20.12.06_20-_20China_20Erweiterung.html.)

Rudi, Fred, 2001, Olivine—A Norwegian forte: Industrial Minerals, no. 410, November, p. 45-49.

Schroeder, Ricardo, 2006, Magnesia in the new world: Industrial Minerals, no. 462, March, p. 78-81.

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

Historical Statistics for Mineral Commodities in the United States. Data Series 140.

Magnesian Refractories. Ch. in United States Mineral Resources, Professional Paper 820, 1973.
Magnesium, its Alloys and Compounds. Open-File Report 01-341, 2001.
Magnesium Compounds. Ch. in Mineral Commodity Summaries, annual.

Other

Industrial Minerals, monthly.
Magnesium Minerals and Compounds. Ch. in Industrial Minerals and Rocks (7th ed.), Society for Mining, Metallurgy, and Exploration, Inc., 2006.
Magnesium. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.
Magnesium and Magnesite in the CIS in 1996. Roskill Information Services Ltd., 1996.
Magnesium Compounds and Chemicals (9th ed.). Roskill Information Services Ltd., 2001.
Olivine (2d ed.). Roskill Information Services Ltd., 1990.

TABLE 1
SALIENT MAGNESIUM COMPOUND STATISTICS[1]

(Thousand metric tons and thousand dollars)

	2002	2003	2004	2005	2006
United States:					
Caustic-calcined and specified magnesias:[2]					
Shipped by producers:[3]					
Quantity	127	154	132	137	116
Value	38,100	61,000	55,400	60,300	52,200
Exports[4]	6	4	4	5	6
Imports for consumption[4]	148	150	157	152	163
Refractory magnesia:					
Shipped by producers:[3]					
Quantity	123	84	W	W	W
Value	37,800	23,500	W	W	W
Exports	73	56	30	25	20
Imports for consumption	394	379	418	478	433
World, production of magnesite	14,100 r	14,400 r	15,100 r	14,100 r	14,100 e

eEstimated. rRevised. W Withheld to avoid disclosing company proprietary data.

[1]Data are rounded to no more than 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 2006[1]

(Metric tons, MgO equivalent)

Raw material source and producing company	Location	Capacity	Products
Brucite, Applied Chemical Magnesias Corp.	Van Horn, TX, and Bullhead City, AZ	25,000	Magnesium hydroxide.
Magnesite, Premier Chemicals LLC	Gabbs, NV	140,000	Caustic-calcined magnesia.
Lake brines:			
Great Salt Lake Minerals Corp.	Ogden, UT	185,000	Magnesium chloride and magnesium chloride brines.
Intrepid Wendover-Potash LLC	Wendover, UT	45,000	Magnesium chloride brines.
Well brines:			
Martin Marietta Magnesia Specialties LLC[2]	Manistee, MI	297,000	Caustic-calcined magnesia, dead-burned magnesia, and magnesium hydroxide.
Rohm and Haas Co.	do.	25,000	Caustic-calcined magnesia and magnesium hydroxide.
Seawater:			
Premier Chemicals LLC	Port St. Joe, FL	107,000	Do.
South Bay Salt Works	Chula Vista, CA	3,000	Magnesium chloride brines.
SPI Pharma Inc.	Lewes, DE	5,000	Magnesium hydroxide.
Total		832,000	

[1]Data are rounded to no more than three significant digits; may not add to total shown.

[2]In addition to its Michigan plant, Martin Marietta owned a 15,000-metric-ton-per-year-capacity magnesium hydroxide plant in Lenoir City, TN, which used imported magnesite as a raw material.

TABLE 3
U.S. MAGNESIUM COMPOUNDS SHIPPED AND USED[1]

	2005		2006	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Caustic-calcined and specified (USP and technical) magnesias[2]	137,000	$60,300	116,000	$52,200
Magnesium hydroxide [100% $Mg(OH)_2$][2]	146,000 r	71,300 r	158,000	78,300
Magnesium sulfate, anhydrous and hydrous	51,700 r	16,700 r	48,000	12,200
Refractory magnesia	W	W	W	W

rRevised. W Withheld to avoid disclosing company proprietary data.
[1]Data are rounded to no more than 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		2005	2006
Magnesia, dead-burned	per short ton	$365-375	$365-375 [1]
Magnesia, synthetic, technical, 98% MgO	do.	490	490 [1]
Magnesium chloride, hydrous, 99%, flake	do.	290	290 [1]
Magnesium chloride, anhydrous, 92%, flake or pebble	per pound	0.1275-0.15	0.128-0.15 [1]
Magnesium hydroxide, powder, technical	do.	0.45	0.45 [1]
Magnesium hydroxide slurry, technical, 100% $Mg(OH)_2$	per short dry ton	238-250	238-250 [1]
Magnesium sulfate, technical (epsom salts)	per pound	0.18-0.215	0.18-0.22 [1]
Olivine, aggregate, free on board plant or mine	per metric ton	50-78	50-78
Olivine, foundry grade, free on board plant or mine	do.	62-109	62-109

[1]Price as of August 28, 2006.

Sources: Chemical Market Reporter and Industrial Minerals.

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

	2005		2006	
Material and country	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Caustic-calcined magnesia:				
France	1,430	$846	1,810	$1,080
Germany	412	246	569	345
Netherlands	475	280	1,500	915
Venezuela	2,200	869	1,480	615
Other	406	257	319	253
Total	4,920	2,500	5,690	3,210
Dead-burned and fused magnesia:				
Brazil	205	193	219	190
Canada	20,800	7,850	16,200	7,630
Germany	550	509	721	550
Mexico	497	642	549	832
Netherlands	333	196	52	46
Norway	82	86	246	278
Poland	297	194	319	236
Taiwan	237	168	242	162
United Kingdom	307	315	252	238
Venezuela	605	243	52	34
Other	1,080 r	990 r	1,180	1,160
Total	24,900	11,400	20,000	11,400

See footnotes at end of table.

TABLE 5—Continued
U.S. EXPORTS OF CRUDE AND PROCESSED MAGNESITE, BY COUNTRY[1]

Material and country	2005 Quantity (metric tons)	2005 Value (thousands)	2006 Quantity (metric tons)	2006 Value (thousands)
Other magnesia:				
Brazil	1,260	$1,540	805	$1,020
Canada	5,480	2,960	5,820	3,350
Germany	2,350	1,510	2,280	1,680
Hong Kong	496	456	865	916
Mexico	3,240	3,000	2,010	2,130
Taiwan	651	538	856	677
United Kingdom	766	757	888	1,170
Venezuela	878	278	1,110	766
Other	6,590 r	7,290 r	6,560	7,170
Total	21,700	18,300	21,200	18,900
Crude magnesite:				
Argentina	1,250	133	442	47
Australia	5,040	588	32	3
Canada	4,770	617	2,780	369
France	4,570	489	983	105
Germany	1,960	212	1,740	186
Mexico	474	53	385	45
Sweden	1,090	117	1,040	139
United Kingdom	1,120	120	41	4
Other	1,550	165	1,580	177
Total	21,800	2,490	9,020	1,080

rRevised.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 6
U.S. EXPORTS OF MAGNESIUM COMPOUNDS[1]

Material	2005 Quantity (metric tons)	2005 Value (thousands)	2006 Quantity (metric tons)	2006 Value (thousands)	Principal destinations, 2006
Magnesium chloride, anhydrous and other	6,060	$3,750	7,650	$5,470	Canada, 80%.
Magnesium hydroxide and peroxide	13,500	11,100	14,200	12,000	Canada, 58%; United Kingdom, 14%.
Magnesium sulfate, natural kieserite and epsom salts	2,780	483	303	208	Canada, 74%; Honduras, 21%.
Magnesium sulfate, other	10,300	4,190	9,600	4,260	Canada, 86%.

[1]Data are rounded to no more than three significant digits.

Source: U.S. Census Bureau.

TABLE 7

U.S. IMPORTS FOR CONSUMPTION OF CRUDE AND PROCESSED MAGNESITE, BY COUNTRY[1]

Material and country	2005 Quantity (metric tons)	2005 Value (thousands)	2006 Quantity (metric tons)	2006 Value (thousands)
Caustic-calcined magnesia:				
Brazil	5,800	$638	8	$2
Canada	40,900	7,390	18,700	4,260
China	96,300	13,700	127,000	16,000
Greece	3,000	759	3,000	824
Hong Kong	--	--	12,600	2,160
Korea, Republic of	5,270	916	--	--
Other	837 r	496 r	1,120	659
Total	152,000	23,900	163,000	23,900
Dead-burned and fused magnesia:				
Australia	13,300	6,910	20,000	6,940
Austria	28,000	14,200	30,500	17,800
China	390,000	82,900	360,000	67,300
Greece	6,050	1,290	6,600	1,720
Hong Kong	20,900	4,310	--	--
Israel	2,010	4,160	2,410	4,540
Japan	3,830	5,520	8,340	6,870
Korea, Republic of	6,200	1,380	1,140	587
Mexico	5,680	2,270	3,240	1,570
Other	1,860	909	1,070	521
Total	478,000	124,000	433,000	108,000
Other magnesia:				
Canada	1,100	297	1,040	294
China	2,690	1,690	1,920	761
Israel	442	648	261	443
Japan	1,300	2,430	1,190	2,360
Mexico	8,120	3,150	11,800	5,480
Netherlands	1,490	1,230	--	--
Slovakia	1,890	654	1,650	478
Other	1,260	1,230	1,230	1,280
Total	18,300	11,300	19,000	11,100
Crude magnesite:				
Brazil	920	241	759	188
China	5,310	297	7,900	996
Israel	2,360	450	2,820	588
Japan	4,330	887	2,790	579
Other	2,080 r	388 r	893	196
Total	15,000	2,260	15,200	2,550

r Revised. -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

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

	2005		2006		
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Principal sources, 2006
Magnesium chloride, anhydrous and other	72,900	$15,100	64,400	$12,100	Israel, 71%; Netherlands, 15%; China, 12%.
Magnesium hydroxide and peroxide	6,240	12,100	10,300	17,100	Israel, 31%; Japan, 24%; Austria, 16%.
Magnesium sulfate, natural epsom salts	1,310	349	1,150	268	India, 64%; Germany, 17%; China, 15%.
Magnesium sulfate, natural kieserite	13,900	1,030	8,920	373	Germany, 100%.
Magnesium sulfate, other	24,500	6,140	22,200	5,980	Germany, 63%; Canada, 21%; China, 11%.

[1]Data are rounded to no more than three significant digits.

Source: U.S. Census Bureau.

TABLE 9
WORLD MAGNESIUM COMPOUNDS ANNUAL PRODUCTION CAPACITY, DECEMBER 31, 2006[1, 2]

(Thousand metric tons, MgO equivalent)

	Raw material				
	Magnesite		Seawater or brines		
Country	Caustic-calcined	Dead-burned	Caustic-calcined	Dead-burned	Total
Australia	78	110	--	--	188
Austria	197	268	--	--	465
Brazil	83	351	--	--	434
Canada	50	--	--	--	50
China	275	2,940	--	10	3,230
France	--	--	30	--	30
Greece	120	100	--	--	220
India	20	296	--	--	316
Iran	--	30	--	--	30
Ireland	--	--	--	90	90
Israel	--	--	10	60	70
Italy	25	--	--	--	25
Japan	--	--	50	250	300
Jordan	--	--	10	50	60
Korea, North	--	1,100	--	--	1,100
Korea, Republic of	--	--	--	40	40
Mexico	--	--	15	95	110
Netherlands	--	--	10	150	160
Poland	--	10	--	--	10
Russia	100	2,400	--	--	2,500
Serbia	40	160	--	--	200
Slovakia	--	465	--	--	465
South Africa	12	--	--	--	12
Spain	145	60	--	--	205
Turkey	15	404	--	--	419
Ukraine	--	120	20	80	220
United States	140	--	201	195	536
Total	1,300	8,810	346	1,020	11,500

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes capacity at operating plants, as well as at plants on standby basis.

TABLE 10
MAGNESITE: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country	2002	2003	2004	2005	2006[e]
Australia	484,498	472,668	473,983 [r]	474,000 [r]	475,000
Austria, crude[e]	728,000 [r]	767,000 [r]	715,000 [r]	694,000 [r]	700,000
Brazil, beneficiated	302,230	306,444	366,174	386,759 [r]	386,800 [p]
Canada[e, 3]	180,000	180,000	180,000	180,000	180,000
China[e]	4,560,000	4,600,000	4,650,000	4,700,000	4,750,000
Colombia[e]	10,500	10,500	10,500	10,500	10,500
Greece, crude	553,700 [r]	549,000 [r]	499,500 [r]	475,700 [r]	500,000
India[e]	380,000	380,000	370,000	380,000 [r]	370,000
Iran	128,565	87,795	88,194	88,000 [e]	90,000
Korea, North[e]	1,000,000	1,000,000	1,200,000	1,200,000	1,200,000
Pakistan	4,637 [r]	2,645 [r]	6,074 [r]	3,029 [r]	4,000
Poland, concentrate	22,100	22,000	22,000 [e]	20,000 [e]	20,000
Russia[e]	1,000,000	1,200,000	1,200,000	1,100,000	1,200,000
Serbia and Montenegro, crude[e]	33,000	25,000	25,000	25,000	25,000
Slovakia, concentrate	929,630	993,900	930,000 [r]	397,259 [r]	400,000
South Africa	87,200	86,100	65,900	54,800 [r]	55,000
Spain	637,024 [r]	517,030 [r]	567,504 [r]	485,800 [r]	500,000
Turkey, run-of-mine	3,044,440	3,224,278	3,732,952	3,400,000 [e]	3,200,000
United States	W	W	W	W	W
Zimbabwe	2,366	1,333	749	893	900
Total	14,100,000 [r]	14,400,000 [r]	15,100,000 [r]	14,100,000 [r]	14,100,000

[e]Estimated. [p]Preliminary. [r]Revised. W Withheld to avoid disclosing company proprietary data; not included in "Total."

[1]World totals, U.S. data, and estimated data are rounded to no more than 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 15, 2007.

[3]Magnesitic dolomite and brucite. Figures are estimated on the basis of reported tonnage dollar value.