



2008 Minerals Yearbook

MAGNESIUM COMPOUNDS

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U.S. production of caustic-calcined magnesia increased and dead-burned (refractory) magnesia production decreased from the levels in 2007. Imports continued to account for more than one-half of U.S. consumption of magnesia. Consumption of refractory magnesia was about 25% less than that in 2007, and caustic-calcined (and other) magnesia consumption increased by 20%, with imports of caustic-calcined (and other) magnesia accounting for about 49% of total U.S. consumption.

About 54% 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 52% of the total consumption of magnesium compounds was for refractory applications. The remaining 48% was used in agricultural, chemical, environmental, and other applications. China remained the dominant supplier of imports for caustic-calcined and refractory (dead-burned and fused) magnesias, with 75% and 83%, respectively, of the totals.

Production

U.S. shipments of caustic-calcined magnesia increased by nearly 37% from those in 2007, and refractory magnesia shipments decreased significantly (table 3) as companies switched the type of magnesia that was produced. Magnesium hydroxide shipments were about 4% higher than those in 2007.

Data for magnesium compounds were collected by the U.S. Geological Survey (USGS) from one voluntary survey of U.S. operations. Of the 15 operations canvassed, 87% responded, representing 99% of the magnesium compounds shipped and used, including data for some compounds that were not reportable in table 3. Data for the two nonrespondents were estimated on the basis of prior-year production levels.

The largest capacity magnesite processing facilities in the world are in China and Russia. Together with the United States, these 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, China, Israel, Japan, the Republic of Korea, Mexico, Russia, the United Kingdom, and the United States. World production capacity for fused magnesia 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 one company in the United States, UCM Group PLC of the United Kingdom, which operated a plant in Cherokee, AL, through its Muscle Shoals Minerals Inc. subsidiary.

Norway has been traditionally the world's principal producer and supplier of olivine, but since 2004, when a new olivine mine was opened in Greenland, Norway's share of world production has dropped to about 30% from about 66%. Other producers include Australia, Austria, Brazil, China, Greece, Italy, Japan, the Republic

of Korea, Mexico, Spain, Taiwan, Turkey, and the United States. Roberts (2008) estimated that total world production of olivine in 2008 was 8.4 million metric tons (Mt). Two companies in the United States produced olivine—Unimin Corp. and Olivine Corp. Unimin operated a mine in North Carolina and processing plants in Indiana and North Carolina. Olivine operated one mine and one processing plant in Washington.

Applied Chemical Magnesias Corp. reportedly filed for chapter 7 bankruptcy in December, and the operations were up for sale. The company operated the only brucitic marble-producing operation in the United States and one of the few brucite mines outside of China. Legal issues surrounding the operation and a significant drop in the price of magnesia were cited as the principal reasons for the filing (O'Driscoll, 2009a).

In February, Martin Marietta Materials, Inc. acquired assets of the Specialty Magnesia Division of Morton International, Inc., including rights to the ElastoMag® trade name. ElastoMag® magnesia is used in rubber compounds like neoprene, where it inhibits premature hardening of the rubber components in the molding process. According to Martin Marietta, the acquisition would allow the consolidation of its rubber- and plastics-grades business in Manistee, MI, and expand its dead-burned dolomite production in Woodville, OH (Martin Marietta Materials, Inc., 2008).

Premier Chemicals, LLC expanded its operations in 2008. It started up a third Herreshoff furnace at its Gabbs, NV, magnesite mine and plant that produced caustic-calcined magnesia and magnesium hydroxide. The company also purchased magnesium sulfate producer Giles Chemical Corp., which operated production plants in Greendale, IN, Rouses Point, NY, and Waynesville, NC (O'Driscoll, 2008c).

Consumption

In 2008, chemical intermediates was the largest tonnage end use for caustic-calcined magnesia, with 38% 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), 31%, and environmental applications (water treatment and stack-gas scrubbing), 29%. The remaining categories each had less than 1% of the total use—construction (primarily oxychloride and oxysulfate cements), manufacturing (rubber and electrical), pharmaceuticals and nutrition, and unspecified uses.

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 fertilizer and in rubber processing. Magnesium sulfate was used mostly for chemical, pulp and paper, fertilizer, rubber,

pharmaceutical, water treatment, cosmetics, and construction 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.

Researchers at Columbia University and the USGS developed a digital geologic database of ultramafic rocks in the conterminous United States. Data were compiled from varied-scale geologic maps of magnesium-silicate ultramafic rocks. The focus of the national-scale map is entirely on ultramafic rock types, which typically consist primarily of olivine- and serpentine-rich rocks. These rock types are potentially suitable as source material for mineral sequestration of carbon dioxide (Krevor and others, 2009).

Foreign Trade

In 2008, dead-burned magnesia exports were slightly less than those in 2007. Canada (66%) was the principal destination. Caustic-calcined magnesia exports were 80% lower than those in 2007. The Netherlands (26%) and France (25%) were the main destinations (table 4).

Imports of caustic-calcined magnesia were 25% higher than those in 2007, and imports of dead-burned magnesia were 12% lower than those in 2007. For both types of magnesia, China was the principal source country (table 6).

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. According to PIERS, there were no U.S. exports of olivine in 2008, and U.S. olivine imports were 8,760 metric tons (t). These data are significantly less than the quantities traditionally reported. Because there is no Harmonized Tariff Schedule number specifically for olivine, some shipments may have been misclassified, and cannot be identified.

World Review

Australia.—In March, Queensland Magnesia Pty. Ltd. (QMAG) approved a \$39 million program to expand its Parkhurst, Queensland, magnesia processing operation by 100,000 t/yr of caustic-calcined magnesia, which would increase production capacity to 320,000 t/yr. The project involved the installation of a third multiple-hearth furnace and associated milling, storage, packaging, and logistics infrastructure. Construction began in July with commissioning scheduled for September 2009. This investment was in addition to the \$33 million that has been invested during the past 3 years to expand the mine, debottleneck the processing plant, and acquire the Yaamba magnesite deposit (Queensland Magnesia Pty. Ltd., 2008).

Causmag Ore Co. Pty. Ltd. announced that it had closed its Young, New South Wales, magnesite mine and processing plant in May because of what the company termed a cash-flow shortage. Causmag (owned by Indian firm Excel Colours & Frits Ltd.) produced caustic-calcined magnesia at its 18,000-t/yr plant, primarily for local agricultural applications. A drought in New South Wales, the country's second-leading grain-producing province, exacerbated Causmag's problems (Industrial Minerals, 2008a). The company reportedly restarted operations in mid-July after an infusion of cash from its parent company.

Brazil.—In September, Magnesita Refratários S.A. (formerly Magnesita S.A.) signed an agreement to acquire Germany's LWB Refractories from Rhône Capital LLC for \$938 million. Closing of the transaction was subject to regulatory approval. Both Magnesita and LWB manufactured refractory products for industrial applications, mainly in the steel and cement industries. Magnesita supplied 70% of the refractories for steel production and 80% of the refractories for cement production in Brazil, and LWB's sales were primarily in Europe and the United States. LWB produced refractory dolomite from plants in Europe with a combined capacity of about 270,000 t/yr, a 150,000-t/yr plant in York, PA, and a 55,000-t/yr plant in China. According to Magnesita, the combination of Magnesita and LWB would create the third-leading refractory company in the world in terms of revenue (Wan, 2008). Magnesita had announced earlier in 2008 that it would triple its dead-burned magnesia production and double its refractories production by 2010. Magnesita mined a magnesite-talc deposit at its Brumado, Bahia, mine, and had the capacity to produce 320,000 t/yr of dead-burned magnesia, 60,000 t/yr of caustic-calcined magnesia, and 48,000 t/yr of talc at its plant in Contagem, Minas Gerais, although the plant reportedly produced at significantly less than full capacity (Industrial Minerals, 2008b).

Canada.—Baymag Ltd. planned to double capacity at its 50,000-t/yr caustic-calcined magnesia plant in Exshaw, Alberta. The company planned to add a second multiple-hearth furnace, with startup scheduled for fall 2009. The company also was studying the restart of its 14,000-t/yr fused magnesia plant that was shut down in 2007 and the potential of producing dead-burned magnesia at the plant (O'Driscoll, 2008b).

Globex Mining Enterprises Inc. and Drinkard Metalox Inc. signed a binding letter of intent to demonstrate the feasibility of certain technologies owned by Drinkard Metalox to recover magnesia from Globex's 100%-owned Deloro magnesite deposit near Timmins, Ontario. The Deloro deposit is a magnesite-talc-silica deposit, which has been reported in historical reports to contain more than 100 Mt of minable material. Under the agreement, Globex and Drinkard Metalox would set up a jointly owned company (75% owned by Globex, and 25%, by Drinkard Metalox) that would undertake bench- and pilot-scale test work and a bankable feasibility study to confirm the applicability and economic feasibility of Drinkard Metalox's patented processes to produce magnesia and other magnesium compounds from the property. Globex would fund up to \$1.5 million for this work (Globex Mining Enterprises Inc., 2008).

China.—Press reports indicated that smuggling magnesite through the Republic of Korea was stopped by government authorities, which resulted in increased prices for magnesia from China. In addition, energy shortages, a shortage of export licenses near the end of 2008, and production shutdowns during the 2008 Olympic Games led to a significant decline in magnesia supplied from China to the world market (O'Driscoll, 2008c). The export quota for magnesite was increased to 1.4 Mt in 2009 from 1.3 Mt in 2008.

Several companies added magnesia production capacity in 2008. Haicheng Huayin Group reportedly opened a new 500,000-t/yr magnesite mine in Tibet. Reserves at the mine were estimated to be 120 Mt of magnesite. Production from the mine

was calcined at a new 150,000-t/yr caustic-calcined magnesia plant and then transported to Liaoning Province as feed for Haicheng Huayin's dead-burned and fused magnesia and magnesia-alumina spinel products (O'Driscoll, 2008a). Liaoning Xiyuan Qinghua Refractories Co. Ltd. (a subsidiary of Yingkou Qinghua Group Co. Ltd.) brought eight new kilns onstream in 2008, which added 140,000 t/yr of high-purity dead-burned magnesia and 80,000-t/yr of magnesite brick capacity. According to the company, Yingkou Qinghua has 6 mines, 96 caustic-calcined magnesia kilns, 12 dead-burned magnesia kilns, 26 fused magnesia kilns, 6 high-purity synthetic magnesia kilns, and 5 magnesia-carbon brick producing lines (O'Driscoll, 2008a; Yingkou Qinghua Group Co. Ltd., undated).

Fengchi Refractories Co. completed construction of three new kilns for the production of dead-burned magnesia in August. These kilns added 100,000 t/yr of production capacity, to bring the company's total dead-burned magnesia production capacity to 290,000 t/yr. The company also has the capacity to produce 80,000 t/yr of caustic-calcined magnesia and 180,000 t/yr of fused magnesia (O'Driscoll, 2008a; Fengchi Refractories Co., undated).

Liaoning Donghe Refractory Group planned to install an 80,000-t/yr high-purity magnesia plant by 2009, with initial output projected at 30,000 t/yr. The company reportedly owned 2 magnesite mines that produce about 500,000 t/yr and operated 20 kilns to produce "light" magnesia, 3 kilns for "medium" magnesia, and 13 kilns for fused magnesia (O'Driscoll, 2008a).

Denmark (Greenland).—Swedish firm Minelco AB planned to increase production at its Seqi olivine mine in Fiskefjord, Greenland, in 2009. Although total production capacity at the mine was 1.1 million metric tons per year (Mt/yr), the operation has been running at about one-half its capacity. Continued increases in freight costs were cited as the main reason for operating at less than the rated capacity. An upturn in demand for refractories and other markets outside the steel industry led to the increased production rate (Industrial Minerals, 2008c).

Russia.—In December, Magnezit Group JSC, the leading Russian manufacturer of refractory materials, announced a marketing agreement with Germany's Hargreaves Raw Material Services GmbH to market its dead-burned and fused magnesia outside Commonwealth of Independent States (CIS) countries. Magnezit traditionally consumed its production for refractories or marketed it within Russia and other CIS countries. Hargreaves expected to export 100,000 to 150,000 t of 90% to 92% magnesium oxide (MgO)-grade magnesia in 2009 (O'Driscoll, 2009b).

Slovakia.—In January, Magnezit acquired 99.6% of Slovomag a.s. Lubenik, which was the second-leading producer of magnesite refractory materials in Slovakia. Magnezit also reportedly was interested in acquiring Slovenské Magnezitové Závody a.s. Jelsava (SMZ). The company offered about \$130 million for shares in SMZ, although no deal was reached before yearend (O'Driscoll, 2008b).

Turkey.—In March, Bommag Ltd. (formerly Calmag AS) was formed when Serbian company Bomex Holding d.o.o. purchased the equipment of Austria's Styromagnesit Steirische Magnesitindustrie GmbH. Bommag operated a 12,000-t/yr rotary kiln and a 7,200-t/yr shaft kiln to produce caustic-calcined magnesia. The company has ordered a 35,000-t/yr shaft kiln,

which was expected to be operational by early 2009, and planned to establish a 7,500-t/yr fused magnesia plant (O'Driscoll, 2008b).

Outlook

Refractories used in kilns in the iron and steel industry was the principal use for dead-burned magnesia. According to the World Steel Association (2009) (formerly International Iron and Steel Institute), world crude steel output was 1.33 billion metric tons in 2008, a decrease of 1.2% from that in 2007. Steel production declined in nearly all the major steel-producing regions; however, production in Asia, in particular China, and the Middle East increased in 2008. China's crude steel production in 2008 reached 502 Mt, an increase of 2.6% from that in 2007. Steel production in China has more than doubled in the past 5 years, and China's share of world steel production continued to increase in 2008, reaching 38% of the world total. A sustained increase in steel production in China could lead to more internal consumption of magnesia-base refractories, which, in turn, could result in less magnesia available for the export market. Changes in export quotas and other Government policies also will affect the supply of magnesia from China to the world market. China, however, has significant magnesite resources, particularly in Liaoning Province, and most likely would continue to develop the magnesite deposits to satisfy domestic and export markets.

Most caustic-calcined magnesia markets are fairly mature, but use of caustic-calcined magnesia and magnesium hydroxide for environmental applications was expected to continue to grow. Because of its superior properties, magnesium hydroxide was expected to continue to replace such materials 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.

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TABLE 1
SALIENT MAGNESIUM COMPOUND STATISTICS¹

(Thousand metric tons and thousand dollars)

	2004	2005	2006	2007	2008
United States:					
Caustic-calcined and specified magnesias: ²					
Shipped by producers: ³					
Quantity	132	137	133	125	170
Value	55,400	60,300	60,300	41,100	52,700
Exports ⁴	4	5	6	4	1
Imports for consumption ⁴	157	152	163	134	167
Refractory magnesia:					
Shipped by producers: ³					
Quantity	W	W	W	W	W
Value	W	W	W	W	W
Exports	30	25	20	22	22
Imports for consumption	418	478	433	437	386
World, production of magnesite	16,500	15,200 ^r	15,200 ^r	16,300 ^r	18,300 ^e

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

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

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

³Includes magnesia used by producers.

TABLE 2

U.S. MAGNESIUM COMPOUND PRODUCERS, BY RAW MATERIAL SOURCE, LOCATION, AND PRODUCTION CAPACITY, IN 2008¹

(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 Potash-Wendover, LLC	Wendover, UT	45,000	Magnesium chloride brines.
Well brines:			
Martin Marietta Magnesia Specialties, LLC ²	Manistee, MI	314,000	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		849,000	

Do., do. Ditto.

¹Data are rounded to no more than three significant digits; may not add to total shown.²In 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 USED¹

	2007		2008	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Caustic-calcined and specified (USP and technical) magnesias ²	125,000	\$41,100	170,000	\$52,700
Magnesium hydroxide [100% Mg(OH) ₂] ²	173,000	81,000	180,000	89,800
Magnesium sulfate, anhydrous and hydrous	48,900	13,400	46,700	15,100
Refractory magnesia	W	W	W	W

W Withheld to avoid disclosing company proprietary data.

¹Data are rounded to no more than three significant digits.²Excludes material produced as an intermediate step in the manufacture of other magnesium compounds.

TABLE 4
U.S. EXPORTS OF CRUDE AND PROCESSED MAGNESITE, BY COUNTRY¹

Material and country	2007		2008	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Caustic-calcined magnesite:				
France	1,430	\$871	225	\$191
Germany	721	449	72	45
Mexico	162	90	144	166
Netherlands	1,560	985	234	169
Venezuela	150	68	--	--
Other	401 ^f	316 ^f	215	208
Total	4,420	2,780	890	779
Dead-burned and fused magnesia:				
Brazil	54	41	21	18
Canada	17,700	7,990	14,600	7,410
France	238	214	166	157
Germany	605	492	552	491
India	20	17	858	475
Mexico	1,660	1,120	1,380	810
Netherlands	371	810	69	163
Poland	119	104	121	117
Taiwan	258	173	370	311
United Kingdom	240	227	229	223
Venezuela	261	132	1,310	654
Other	846 ^f	731 ^f	2,440	2,250
Total	22,400	12,000	22,100	13,100
Other magnesia:				
Bahamas, The	524	472	1,060	1,020
Brazil	1,490	1,590	912	927
Canada	3,210	2,630	4,690	3,640
France	402	406	815	675
Germany	345	269	1,010	944
Hong Kong	733	745	174	247
Korea, Republic of	1,070	1,230	1,620	1,340
Mexico	1,980	2,220	1,440	1,720
Netherlands	359	262	1,260	965
Taiwan	1,100	974	1,240	1,140
Turkey	867	938	670	904
United Kingdom	259	394	89	166
Venezuela	461	479	258	404
Other	2,750 ^f	3,880 ^f	2,850	4,800
Total	15,500	16,500	18,100	18,900
Crude magnesite:				
Argentina	1,130	129	710	93
Canada	2,770	382	3,720	669
China	1,390	268	5,570	1,090
France	2,460	281	2,840	372
Germany	591	72	931	123
Italy	--	--	1,720	225
Mexico	761	126	316	45
Sweden	--	--	1,080	177
Other	2,570	295	4,150	556
Total	11,700	1,550	21,000	3,350

^fRevised. -- Zero.

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

Source: U.S. Census Bureau.

TABLE 5
U.S. EXPORTS OF MAGNESIUM COMPOUNDS¹

Material	2007		2008		Principal destinations, 2008
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	
Magnesium chloride, anhydrous and other	7,690	\$5,480	8,180	\$8,050	Canada, 76%; United Kingdom, 10%.
Magnesium hydroxide and peroxide	15,200	11,800	18,400	15,500	Canada, 47%; United Kingdom, 18%; Mexico, 6%.
Magnesium sulfate, natural kieserite and epsom salts	733	474	103	209	Mexico, 40%; Canada, 38%.
Magnesium sulfate, other	10,500	5,100	11,300	5,340	Canada, 95%.

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

Source: U.S. Census Bureau.

TABLE 6
U.S. IMPORTS FOR CONSUMPTION OF CRUDE AND PROCESSED MAGNESITE, BY COUNTRY¹

Material and country	2007		2008	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Caustic-calcined magnesia:				
Brazil	--	--	15,600	\$6,030
Canada	15,700	\$4,580	21,500	7,480
China	117,000	14,900	126,000	24,900
Greece	--	--	1,620	731
Israel	23	57	609	173
Turkey	1,220	530	2,010	1,090
Total	134,000	20,100	167,000	40,400
Dead-burned and fused magnesia:				
Australia	16,800	5,800	7,280	9,480
Austria	32,700	18,200	31,200	17,600
China	364,000	84,100	319,000	136,000
Greece	13,200	4,420	11,200	4,560
Israel	2,310	4,430	4,640	12,500
Japan	3,010	5,320	2,540	4,750
Mexico	2,820	1,310	2,310	1,310
Spain	941	420	5,780	2,130
Other	916 ^r	699 ^r	2,050	1,260
Total	437,000	125,000	386,000	190,000
Other magnesia:				
Brazil	418	435	689	821
Canada	2,780	933	542	187
China	4,610	1,740	1,060	2,320
Israel	572	872	569	1,080
Japan	940	1,960	1,220	3,010
Mexico	9,910	4,790	8,850	5,740
Slovakia	1,390	386	751	228
Other	276 ^r	382 ^r	258	647
Total	20,900	11,500	13,900	14,000
Crude magnesite:				
Brazil	575	238	133	148
China	4,070	652	13,900	3,770
Israel	2,120	619	1,000	849
Japan	1,960	629	426	740
Other	283	82	383	214
Total	9,000	2,220	15,800	5,720

^rRevised. -- Zero.

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

Source: U.S. Census Bureau.

TABLE 7
U.S. IMPORTS FOR CONSUMPTION OF MAGNESIUM COMPOUNDS¹

	2007		2008		Principal sources, 2008
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	
Magnesium chloride, anhydrous and other	49,100	\$10,100	71,400	\$15,900	Israel, 77%; Netherlands, 21%.
Magnesium hydroxide and peroxide	8,630	14,800	7,310	16,400	Israel, 36%; Netherlands, 17%; Austria, 12%.
Magnesium sulfate, natural epsom salts	465	195	528	202	China, 64%; Canada, 24%.
Magnesium sulfate, natural kieserite	5,830	334	51,100	1,100	Germany, 100%.
Magnesium sulfate, other	28,300	8,390	31,200	15,000	Germany, 46%; China, 23%; Mexico, 16%.

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

Source: U.S. Census Bureau.

TABLE 8
WORLD MAGNESIUM COMPOUNDS ANNUAL PRODUCTION CAPACITY,
DECEMBER 31, 2008^{1,2}

(Thousand metric tons, MgO equivalent)

Country	Raw material				Total
	Magnesite		Seawater or brines		
	Caustic- calcined	Dead- burned	Caustic- calcined	Dead- burned	
Australia	78	120	--	--	198
Austria	70	405	--	--	475
Brazil	66	320	--	--	386
Canada	50	--	--	--	50
China	430	2,270	--	10	2,710
France	--	--	30	--	30
Greece	120	100	--	--	220
India	20	202	--	--	222
Iran	25	40	--	--	65
Ireland	--	--	--	90	90
Israel	--	--	10	60	70
Italy	25	--	--	--	25
Japan	--	--	55	200	255
Jordan	--	--	10	50	60
Korea, North	20	100	--	--	120
Korea, Republic of	--	--	--	40	40
Mexico	--	--	15	95	110
Netherlands	--	--	10	165	175
Norway	--	--	25	--	25
Poland	--	10	--	--	10
Russia	100	2,400	--	--	2,500
Serbia	--	40	--	--	40
Slovakia	--	465	--	--	465
South Africa	12	--	--	--	12
Spain	140	70	--	--	210
Turkey	20	404	--	--	424
Ukraine	--	120	20	80	220
United States	140	--	201	195	536
Total	1,320	7,060	376	985	9,740

-- Zero.

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

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

TABLE 9
MAGNESITE: WORLD PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country	2004	2005	2006	2007	2008 ^c
Australia	473,983	474,000	446,000	447,000 ^r	450,000
Austria, crude	715,459 ^r	693,754 ^r	769,188 ^r	811,556 ^r	800,000
Brazil, beneficiated	366,174	386,759	382,718 ^r	399,314 ^r	400,000 ^p
Canada ^{e,3}	180,000	180,000	180,000	180,000	180,000
China ^e	6,500,000	6,600,000	6,700,000	8,000,000 ^r	10,000,000
Colombia ^e	36,000 ^r	38,000 ^r	40,000 ^r	42,000 ^r	44,000
Greece, crude	499,474	475,670	463,277 ^r	351,414 ^r	350,000
India ^e	370,000	380,000	370,000	360,000	350,000
Iran	88,194	114,708	110,000 ^e	110,000	110,000
Korea, North ^e	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Pakistan	6,074	3,029	1,884 ^r	1,400 ^r	1,600
Poland, concentrate	57,900	57,000 ^r	63,000 ^r	65,000 ^r	65,000
Russia ^e	1,200,000	1,100,000	1,200,000	1,200,000	1,200,000
Serbia, crude ^e	20,000 ⁴	20,000 ⁴	20,000	20,000	20,000
Slovakia, concentrate	404,776	447,700	555,710	457,763 ^r	460,000
South Africa	65,900	54,800	73,300	80,700 ^r	81,000
Spain	567,504	556,129 ^r	539,239 ^r	461,901 ^{r,p}	460,000
Turkey, run-of-mine	3,732,952	2,372,206	2,088,033	2,100,000	2,100,000
United States	W	W	W	W	W
Zimbabwe	749	893	939 ^r	2,000 ^{r,e}	2,000
Total	16,500,000	15,200,000 ^r	15,200,000 ^r	16,300,000 ^r	18,300,000

^eEstimated. ^pPreliminary. ^rRevised. W Withheld to avoid disclosing company proprietary data; not included in "Total."

¹World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Figures 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 12, 2009.

³Magnesitic dolomite and brucite.

⁴Montenegro and Serbia formally declared independence in June 2006 from each other and dissolved their union.