



# 2010 Minerals Yearbook

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## MAGNESIUM COMPOUNDS [ADVANCE RELEASE]

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# MAGNESIUM COMPOUNDS

By Deborah A. Kramer

**Domestic survey data and tables were prepared by Paula R. Neely, statistical assistant, and the world production table was prepared by Lisa D. Miller, international data coordinator.**

In 2010, a significant increase in domestic steel production led to increased production, imports for consumption, and consumption of dead-burned (refractory) magnesia in the United States. Dead-burned magnesia production nearly doubled, and imports for consumption increased by more than 100% to meet the increased demand for refractories from the steel industry. China continued to be the principal source of imports of dead-burned magnesia, accounting for 66% of the total. U.S. production, imports for consumption, and consumption of caustic-calcined magnesia also increased, but not as significantly as those of dead-burned magnesia.

About 56% of U.S. magnesium compounds production came from seawater and well and lake brines. The remainder was recovered from dolomite, magnesite, and olivine. With increased steel production, refractory applications represented about 53% of total U.S. consumption of magnesium compounds, which was a significant increase from 40% of the 2009 total. The remaining 47% of total consumption was used in agricultural, chemical, environmental, and other applications.

## Legislation and Government Programs

In August, the U.S. Department of Commerce, International Trade Administration (ITA) published its final determinations of its investigation of dumping of magnesia-carbon brick from China and Mexico into the United States. The ITA established a dumping margin of 128.10% ad valorem for 14 producing and (or) exporting companies in China and 236% ad valorem as the China-wide rate. For Mexico, the ITA determined a dumping margin of 57.90% ad valorem (U.S. Department of Commerce, International Trade Administration, 2010a, c). Because the ITA also found that subsidies existed for magnesia-carbon bricks exported from China, it established countervailing duties of 24.24% ad valorem for most companies exporting from China, with one firm having a rate of 253.87% ad valorem (U.S. Department of Commerce, International Trade Administration, 2010b). U.S. magnesia-carbon brick manufacturer Resco Products Inc. had filed the original complaint in 2009.

## Production

As the global economy began to recover, domestic production of all magnesium compounds increased. U.S. shipments of caustic-calcined magnesia were 10% higher than those in 2009, and refractory magnesia shipments increased significantly in response to increased U.S. steel production (table 3). Magnesium hydroxide shipments increased by 3% from those in 2009.

Data for magnesium compounds were collected by the U.S. Geological Survey (USGS) from one voluntary survey of U.S. operations. Of the 12 operations canvassed, 10 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. These countries accounted for about two-thirds of the world magnesia from magnesite production capacity. Japan, the Netherlands, and the United States accounted for about 56% of the world's magnesia 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 UCM Magnesia Inc. subsidiary.

Norway traditionally has been 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), although the total was likely smaller in 2010 because of mine closures that resulted from the global economic downturn in 2008–09. 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.

International Brucite Corp. (a subsidiary of Texas Architectural Aggregate, Inc.) (TAA) purchased the Marble Canyon, TX, deposit of brucitic marble from Applied Chemical Magnesias Corp., which had filed for bankruptcy in 2008. TAA had owned the deposit before Applied Chemical Magnesias was formed in 1998 to exploit the deposit. According to TAA, the deposit contained 2.35 Mt of proven reserves. In November, International Brucite contacted Austin Technology Incubator for assistance in starting its new business. Austin Technology Incubator is a nonprofit unit of the University of Texas at Austin that provides support to its member companies to help them transition from early-stage ventures to successful technology businesses. International Brucite planned to market its product for water-treatment and industrial neutralization applications (Industrial Minerals, 2011).

Some magnesia consumers and U.S. farmers filed class action lawsuits against Premier Magnesia LLC, credit agency YAS Inc., and Japanese firm Sumitomo Corp. alleging that these companies engaged in “price fixing” of magnesia-containing products that were manufactured or distributed after January 1, 2004. The complaint stated that the three companies agreed to control the price of magnesia used in feed and fertilizers, and attorneys for the plaintiffs were asking for relief for indirect purchasers of the material. The lawsuit was originally filed in September by Orangeburg Milling Co. Inc. as a class action lawsuit, and other groups joined the lawsuit before yearend (O’Driscoll, 2011).

### Consumption

In 2010, the environmental applications sector (water treatment and stack-gas scrubbing) was the largest tonnage end use for caustic-calcined magnesia, with 47% 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), 28%, and chemical intermediates, 23%. The remaining categories each had less than 2% of the total use—manufacturing (rubber and electrical), construction (primarily oxychloride and oxysulfate cements), and medicines and cosmetics.

Magnesium hydroxide was used for water treatment, as a chemical intermediate, in medicines and pharmaceuticals, and in fertilizer (in descending order of quantity). Magnesium sulfate was used mostly for chemicals, fertilizers, pulp and paper, rubber, pharmaceuticals, and water treatment (in descending order of quantity). Magnesium chloride was used mainly for ice control. Magnesium chloride brines were used for road dust and ice control.

### Foreign Trade

Dead-burned and fused magnesia exports in 2010 were 3% higher than those in 2009. Canada (51%) was the principal destination. Caustic-calcined magnesia exports were 45% less than those in 2009. Mexico (48%) was the main destination (table 4).

Imports of dead-burned and fused magnesia were 113% higher than those in 2009, reflecting an increase in steel production; data reported by the World Steel Association (2011) indicated that U.S. steel production had increased by nearly 36% from 2009 to 2010. Imports of dead-burned and fused magnesia from China represented 66% of the total. Imports of caustic-calcined magnesia were slightly higher than those in 2009. China (43%) and Canada (24%) remained the principal sources (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) provides data on material that travels by ship. According to PIERS, U.S. exports of olivine in 2010 were 19 metric tons (t) to Mexico. U.S. olivine imports were 19,800 t; 98% came from Norway, and 2% came from China. Olivine was thought to be included in the Harmonized Tariff Schedule number for iron ore.

### World Review

**European Union.**—In November, the European Union (EU) began a 15-month review of imports of magnesia refractory bricks from China after an antidumping ruling expired in September. The antidumping duties, which were established in 2005, ranged from 8.1% to 39.9%, applicable to the net free-at-Community-frontier price, depending upon the exporting company. The review request was made by the Magnesia Bricks Production Defence Coalition, which represented 25% of the EU’s magnesia refractory brick manufacturers. The leading magnesia refractories manufacturer, Austria-based RHI AG, which was not a member of the coalition, did not support the duties. RHI had recently installed a new kiln at its subsidiary in Dalian, China (Industrial Minerals, 2010a).

**Australia.**—Queensland Magnesia Pty. Ltd. returned to full production capacity in June after running at about 25% of capacity since the beginning of 2009. The company also completed an expansion that increased its capacity by about 50% to bring the total to 175,000 t/yr of caustic-calcined magnesia, 135,000 t/yr of dead-burned magnesia, and 35,000 t/yr of fused magnesia (O’Driscoll, 2010g).

Beacon Hill Resources Plc received State government approval to develop its magnesite deposits in the Lyons River and Arthur River areas of northwestern Tasmania and, in the fourth quarter, began drilling to delineate the magnesite resource. As part of a 2011 work plan, the company planned to start additional drilling in the first quarter to develop a better understanding of the ore body and to produce additional core samples for metallurgical testing (Beacon Hill Resources Plc, 2010).

**Brazil.**—In August, Magnesita Refratários S.A. announced that it would increase production of dead-burned magnesia at its Contagem, Minas Gerais, plant by 2013. The expansion originally was announced in 2008, but because of the global economic downturn, it had not been initiated. Magnesita planned to increase capacity by 120,000 t/yr in two 60,000-t/yr increments. The first phase was estimated to cost \$68.5 million and would involve installation of two furnaces and peripheral equipment (O’Driscoll, 2010b).

**China.**—China set its export quota for magnesia at 1.23 Mt for 2011. This was 8% lower than the 1.33 Mt quota in 2010 (O’Driscoll and Roberts, 2010).

India’s Tata Refractories Ltd. announced that it would expand the production capacity at its TRL China magnesia refractories plant in Bayuquan to 90,000 t/yr from 54,000 t/yr. The expansion was scheduled to be completed by yearend. TRL China sold about 10% of its output locally, and the bulk of the refractory material produced there was exported to countries in Europe and Southeast Asia and to India. TRL China is owned 92% by Tata Refractories and 8% by Chinese firms (Industrial Minerals, 2010b).

Huayin Group Corp. expected to complete a 105,000-t/yr caustic-calcined magnesia plant in Tibet Autonomous Region by May 2011 and had plans to complete a second 250,000-t/yr plant by 2012. The first plant was being constructed to use fine-grained magnesite from the company’s magnesite mine in Kamaduo, which opened in 2007. The caustic-calcined magnesia would be trucked and railed more than 3,000

kilometers to Huayin's Haicheng, Liaoning Province, facility, where it would be used as feedstock for fused magnesia and magnesia-spinel refractories production (O'Driscoll, 2010f).

**Denmark (Greenland).**—In February, Minelco A/S [a subsidiary of Swedish iron ore producer Luossavaara-Kiirunavaara AB (LKAB)] announced that it was closing its Seqi olivine mine in Seqinersuusaaq, Greenland, by yearend. The 2-Mt/yr capacity mine, which had opened in 2005, was the second leading mine in terms of production capacity and represented nearly 25% of the global olivine production capacity, with most of the rest in Norway. Minelco cited unfavorable market conditions and low olivine prices as the reason for the closure (Roberts, 2010a). In June, LKAB announced that it had signed a long-term contract with Norway's North Cape Minerals A/S to supply the company's olivine requirements. North Cape had been the LKAB's olivine supplier until LKAB opened the Greenland mine (Roberts, 2010b).

**India.**—A new joint venture between National Mineral Development Co. Ltd. (74%) and J&K Minerals Ltd. (26%) planned to develop the Panthal magnesite deposit and build a 36,500-t/yr dead-burned magnesia plant at the site by August 2012. The deposit reportedly was estimated to contain 4.05 Mt of magnesite. The project was originally proposed in 1992, but because of the availability of low-cost imports of dead-burned magnesia from China, the deposit was not developed. The recent decline in availability of high-quality dead-burned magnesia from China prompted renewed interest in the deposit (O'Driscoll, 2010d).

**Slovakia.**—Russian firm Magnezit Group, which owned Slovmag a.s. Lubeník, one of Slovakia's two magnesite producers, planned to increase magnesia-based refractory brick production at the Lubenik plant. Slovmag had the capacity to produce 150,000 t/yr of magnesia-based bricks, and production was scheduled to increase by 25,000 t/yr of magnesia-carbon bricks, 15,000 t/yr of magnesia-chrome bricks, 10,000 t/yr of magnesia-spinel bricks, and 5,000 t/yr of magnesia bricks. The expansion was expected to be completed in 2011 (O'Driscoll, 2010c).

**Spain.**—Magnesitas Navarras S.A., Spain's leading magnesite producer, planned to open two new magnesite mines, which would extend the company's reserves by 30 years. The Borobia and Zilbeti Mines were scheduled to open in the first quarter of 2011 to replace the company's Azkarate Mine complex, which had reserves that were estimated to last only 6 to 7 years beyond 2010 at an extraction rate of 440,000 t/yr. The Borobia Mine reportedly had magnesite reserves of 50 Mt that would yield a finished product containing 88% MgO, and the Zilbeti Mine had 7 Mt of magnesite reserves that would yield a product containing greater than 65% MgO, with a low silica content. The company initially planned to extract 6 Mt from Borobia and 7 Mt from Zilbeti. Production from the new mines was expected to be 180,000 t/yr each (O'Driscoll, 2010e).

**Turkey.**—Trabzon Mining and Metal Corp., which had expected to have a 100,000-t/yr dead-burned magnesia plant onstream in Askale by the beginning of 2010, began producing test quantities at the end of 2010. The company expected to have commercial production available at the beginning of 2011 and planned to mine 280,000 t/yr of magnesite from eight open pit mines in the Erzurum and Erzincan regions. Trabzon Mining

estimated that it owned 4.2 Mt of magnesite reserves in the open pit mining areas (O'Driscoll, 2010h).

In May, Kümaş Kütahya Manyezit İşletmeleri A.Ş. began production from a new 6,500-t/yr fused magnesia furnace, which doubled the company's fused magnesia production capacity. The company also planned to build a 25,000-t/yr dead-burned magnesia shaft kiln, which was expected to come onstream by early 2011. The expansions were in anticipation of reduced magnesia supplies from China (O'Driscoll, 2010a).

## Outlook

According to the World Steel Association (2011), world crude steel output was 1.41 billion metric tons in 2010, a 15% increase from that in 2009 and a new world record for steel production. Production in the United States increased by nearly 36% compared with the low production level in 2009, indicating an improvement in the U.S. economy. Of the top 10 steel-producing countries, the largest percentage increase in production was in the United States. China continued to be the leading steel-producing nation, accounting for 44% of the global total in 2010, which was a 9.3% increase from production in 2009. A sustained increase in steel production in China could lead to more internal consumption of magnesia-based refractories, which could result in less magnesia available for the export market. China, however, has significant magnesite resources, particularly in Liaoning Province, and could continue to develop the magnesite deposits to satisfy domestic and export markets.

Because caustic-calcined magnesia is used in a wide variety of applications, the economic downturn did not affect consumption as significantly as consumption of refractory magnesia, which was directly tied to the performance of the U.S. steel industry. Increased use in water treatment (along with magnesium hydroxide) was expected to be the principal growth area for caustic-calcined magnesia.

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## GENERAL SOURCES OF INFORMATION

### U.S. Geological Survey Publications

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

TABLE 1  
SALIENT MAGNESIUM COMPOUND STATISTICS<sup>1</sup>

(Thousand metric tons and thousand dollars)

	2006	2007	2008	2009	2010
United States:					
Caustic-calcined and specified magnesias: <sup>2</sup>					
Shipped by producers: <sup>3</sup>					
Quantity	133	125	170	147	162
Value	60,300	41,100	52,700	42,200	47,000
Exports <sup>4</sup>	6	4	1	1	(5)
Imports for consumption <sup>4</sup>	163	134	167	126	127
Refractory magnesia:					
Shipped by producers:					
Quantity	W	W	W	W	W
Value	W	W	W	W	W
Exports	20	22	22	8	9
Imports for consumption	433	437	386	151	323
World, production of magnesite	14,400 <sup>r</sup>	20,300 <sup>r</sup>	21,500 <sup>r</sup>	18,200 <sup>r</sup>	19,900 <sup>e</sup>

<sup>e</sup>Estimated. <sup>r</sup>Revised. W Withheld to avoid disclosing company proprietary data.

<sup>1</sup>Data are rounded to no more than three significant digits.

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

<sup>3</sup>Includes magnesia used by producers.

<sup>4</sup>Caustic-calcined magnesia only.

<sup>5</sup>Less than ½ unit.

TABLE 2

U.S. MAGNESIUM COMPOUND PRODUCERS, BY RAW MATERIAL SOURCE, LOCATION, AND PRODUCTION CAPACITY, IN 2010<sup>1</sup>

(Metric tons, MgO equivalent)

Raw material source and producing company	Location	Capacity	Products
Magnesite, Premier Magnesia 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 <sup>2</sup>	Manistee, MI	314,000	Caustic-calcined magnesia, dead-burned magnesia, and magnesium hydroxide.
Seawater:			
Premier Magnesia LLC	Port St. Joe, FL	107,000	Caustic-calcined magnesia and magnesium hydroxide.
South Bay Salt Works	Chula Vista, CA	3,000	Magnesium chloride brines.
SPI Pharma Inc.	Lewes, DE	5,000	Magnesium hydroxide.
Total		799,000	

<sup>1</sup>Data are rounded to no more than three significant digits; may not add to total shown.<sup>2</sup>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<sup>1</sup>

	2009		2010	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Caustic-calcined and specified (USP and technical) magnesias <sup>2</sup>	147,000	\$42,200	162,000	\$47,000
Magnesium hydroxide [100% Mg(OH) <sub>2</sub> ] <sup>2</sup>	166,000 <sup>r</sup>	104,000	171,000	107,000
Magnesium sulfate, anhydrous and hydrous	40,100	11,600 <sup>r</sup>	47,400	20,600
Refractory magnesia	W	W	W	W

<sup>r</sup>Revised. W Withheld to avoid disclosing company proprietary data.<sup>1</sup>Data are rounded to no more than three significant digits.<sup>2</sup>Excludes material produced as an intermediate step in the manufacture of other magnesium compounds.

TABLE 4  
U.S. EXPORTS OF CRUDE AND PROCESSED MAGNESITE, BY COUNTRY<sup>1</sup>

Material and country	2009		2010	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
<b>Caustic-calcined magnesia:</b>				
China	81	\$41	94	\$57
India	--	--	27	21
Mexico	57	29	134	76
Thailand	351	178	--	--
Other	14	48	23	11
Total	503	296	278	165
<b>Dead-burned and fused magnesia:</b>				
Canada	5,580	3,420	4,380	2,780
China	697	517	88	127
Germany	120	113	540	502
Hong Kong	140	114	59	75
India	226	214	65	59
Mexico	435	429	217	380
South Africa	30	18	839	461
Taiwan	40	36	155	169
United Kingdom	57	62	150	249
Venezuela	124	144	1,020	592
Other	940 <sup>r</sup>	891 <sup>r</sup>	1,140	1,150
Total	8,390	5,950	8,650	6,550
<b>Other magnesia:</b>				
Brazil	858	959	1,420	1,520
Canada	2,600	2,510	2,730	3,000
France	1,170	1,050	1,580	1,450
Germany	798	634	934	903
India	275	275	576	544
Korea, Republic of	1,770	1,420	767	685
Mexico	1,100	1,360	590	1,040
Netherlands	684	563	2,610	2,040
Taiwan	1,280	1,230	1,950	1,650
Other	2,130 <sup>r</sup>	3,530 <sup>r</sup>	4,910	7,450
Total	12,700	13,500	18,100	20,300
<b>Crude magnesite:</b>				
Argentina	43	6	382	50
Canada	3,020	499	2,340	414
China	205	28	--	--
Egypt	153	20	736	97
France	2,810	370	--	--
Germany	651	85	792	104
Italy	760	84	614	80
Netherlands	945	124	461	60
Saudi Arabia	497	65	963	126
Sweden	--	--	536	105
United Kingdom	679	89	337	44
Other	707 <sup>r</sup>	108 <sup>r</sup>	1,760	234
Total	10,500	1,480	8,920	1,310

<sup>r</sup>Revised. -- Zero.

<sup>1</sup>Data 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 COMPOUNDS<sup>1</sup>

Material	2009		2010		Principal destinations in 2010
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	
Magnesium chloride, anhydrous and other	7,780	\$5,480	8,030	\$6,260	Canada, 84%; Italy, 8%.
Magnesium hydroxide and peroxide	19,100	17,500	16,700	13,800	Canada, 66%; Mexico, 8%.
Magnesium sulfate, natural kieserite and epsom salts	207	311	255	265	Saudi Arabia, 56%; Mexico, 16%; Canada, 12%.
Magnesium sulfate, other	10,600	5,000	9,920	4,810	Canada, 94%; Mexico, 4%.

<sup>1</sup>Data 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 COUNTRY<sup>1</sup>

Material and country	2009		2010	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
<b>Caustic-calcined magnesia:</b>				
Australia	5,070	\$1,490	14,900	\$4,130
Brazil	15,400	3,770	11,800	3,270
Canada	26,300	11,000	30,400	13,100
China	79,000	21,300	55,000	14,000
Hong Kong	--	--	7,930	2,530
Spain	--	--	3,800	1,220
Turkey	--	--	2,110	1,290
United Kingdom	136	140	168	179
Other	25 <sup>r</sup>	27 <sup>r</sup>	1,280	588
<b>Total</b>	<b>126,000</b>	<b>37,700</b>	<b>127,000</b>	<b>40,300</b>
<b>Dead-burned and fused magnesia:</b>				
Australia	650	250	42,300	17,600
Austria	21,200	12,300	2,920	1,250
Brazil	22,200	7,690	26,600	8,100
China	96,900	34,200	213,000	99,000
Germany	14	38	3,110	2,630
Greece	101	44	6,760	2,580
Israel	3,530	10,500	4,140	11,900
Japan	2,380	5,060	2,210	4,900
Mexico	1,160	690	6,710	3,750
Russia	60	12	10,800	3,970
Spain	2,000	644	3,950	1,290
Other	1,080 <sup>r</sup>	776 <sup>r</sup>	645	3,960
<b>Total</b>	<b>151,000</b>	<b>72,200</b>	<b>323,000</b>	<b>161,000</b>
<b>Other magnesia:</b>				
Brazil	179	272	646	3,310
Canada	552	326	564	328
China	467	760	427	499
Israel	374	802	558	1,310
Japan	569	1,430	1,000	2,570
Mexico	5,160	3,650	4,090	3,450
Slovakia	1,070	370	1,670	549
Spain	119	63	2,740	1,310
Other	242 <sup>r</sup>	1,080 <sup>r</sup>	265	1,220
<b>Total</b>	<b>8,740</b>	<b>8,750</b>	<b>12,000</b>	<b>14,500</b>
<b>Crude magnesite:</b>				
Brazil	209	221	516	414
China	3,330	472	9,980	2,130
France	208	184	240	219
Hong Kong	--	--	8,400	2,550
Israel	1,690	1,580	1,540	1,380
Japan	472	1,130	254	482
United Kingdom	176	186	1,130	1,010
Other	184	59	350	238
<b>Total</b>	<b>6,270</b>	<b>3,830</b>	<b>22,400</b>	<b>8,420</b>

<sup>r</sup>Revised. -- Zero.

<sup>1</sup>Data 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 COMPOUNDS<sup>1</sup>

	2009		2010		Principal sources in 2010
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	
Magnesium chloride, anhydrous and other	88,000	\$21,500	87,900	\$24,100	Israel, 73%; Netherlands, 24%.
Magnesium hydroxide and peroxide	2,930	6,440	5,500	13,900	Israel, 28%; Austria, 22%; Mexico, 15%.
Magnesium sulfate, natural epsom salts	1,740	378	3,340	780	China, 72%; India, 26%.
Magnesium sulfate, natural kieserite	25,800	574	5,900	134	Germany, 100%.
Magnesium sulfate, other	15,000	9,660	19,000	10,100	China, 44%; Germany, 36%.

<sup>1</sup>Data are rounded to no more than three significant digits.

Source: U.S. Census Bureau.

TABLE 8  
WORLD MAGNESIUM COMPOUNDS ANNUAL PRODUCTION CAPACITY,  
DECEMBER 31, 2010<sup>1,2</sup>

(Thousand metric tons, MgO equivalent)

Country	Raw material				Total
	Magnesite		Seawater or brines		
	Caustic- calcined	Dead- burned	Caustic- calcined	Dead- burned	
Australia	218	110	--	--	328
Austria	76	325	--	--	401
Brazil	96	320	12	--	428
Canada	100	--	--	--	100
China	1,440	2,740	--	--	4,180
France	--	--	30	--	30
Greece	200	100	--	--	300
India	20	202	--	--	222
Iran	25	40	--	--	65
Ireland	--	--	--	90	90
Israel	--	--	10	60	70
Italy	25	--	--	--	25
Japan	--	--	50	70	120
Jordan	--	--	10	50	60
Korea, North	25	100	--	--	125
Korea, Republic of	--	--	--	40	40
Mexico	--	--	15	95	110
Netherlands	--	--	10	165	175
Norway	--	--	30	--	30
Poland	--	10	--	--	10
Russia	150	2,400	--	--	2,550
Serbia	--	40	--	--	40
Slovakia	--	465	--	--	465
South Africa	12	--	--	--	12
Spain	150	70	--	--	220
Turkey	33	404	--	--	437
Ukraine	--	120	20	80	220
United States	140	--	191	195	526
Total	2,710	7,450	378	845	11,400

-- Zero.

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

<sup>2</sup>Includes capacity at operating plants, as well as at plants on standby basis.

TABLE 9  
MAGNESITE: WORLD PRODUCTION, BY COUNTRY<sup>1,2</sup>

(Metric tons)

Country	2006	2007	2008	2009	2010 <sup>e</sup>
Australia	446,000	447,000	126,000	344,000 <sup>r</sup>	300,000
Austria, crude	769,188	811,556	837,476	544,716 <sup>r</sup>	700,000
Brazil, beneficiated	382,718	399,314	421,333 <sup>r</sup>	400,000	400,000 <sup>p</sup>
Canada <sup>e,3</sup>	140,000 <sup>r</sup>	140,000 <sup>r</sup>	140,000 <sup>r</sup>	140,000 <sup>r</sup>	150,000
China <sup>e</sup>	6,700,000	14,000,000 <sup>r</sup>	15,600,000 <sup>r</sup>	13,000,000 <sup>r</sup>	14,000,000
Colombia <sup>e</sup>	40,000	42,000	38,000	-- <sup>r</sup>	--
Greece, crude	463,277	351,414	361,165	250,234 <sup>r</sup>	300,000
Guatemala	1,084	7,612	11,758	17,247 <sup>4</sup>	17,500
India <sup>e</sup>	370,000	360,000	350,000	340,000	330,000
Iran	110,000	112,229 <sup>r,4</sup>	115,987 <sup>r,4</sup>	115,000 <sup>e</sup>	115,000
Korea, North <sup>e</sup>	60,000 <sup>r</sup>	55,000 <sup>r</sup>	150,000 <sup>r</sup>	150,000 <sup>r</sup>	150,000
Pakistan	1,884	2,370 <sup>r</sup>	1,600 <sup>e</sup>	2,000 <sup>r</sup>	1,800
Poland, concentrate	62,500	65,000	60,000 <sup>r,e</sup>	47,000 <sup>r</sup>	50,000
Russia <sup>e</sup>	1,200,000	1,200,000	1,200,000	1,000,000	1,200,000
Serbia, crude <sup>e</sup>	20,000	20,000	20,000	20,000	20,000
Slovakia, concentrate	941,000	957,000	807,000	478,000 <sup>r</sup>	650,100 <sup>4</sup>
South Africa	73,300	80,700	83,900	75,000 <sup>r,e</sup>	80,000
Spain	539,239	461,901	460,000 <sup>e</sup>	460,000	460,000
Turkey, run-of-mine	2,088,033	802,406 <sup>r</sup>	677,784 <sup>r</sup>	861,180 <sup>r</sup>	1,000,000
United States	W	W	W	W	W
Zimbabwe	939	1,814 <sup>r</sup>	2,549 <sup>r</sup>	449 <sup>r</sup>	500
Total	14,400,000 <sup>r</sup>	20,300,000 <sup>r</sup>	21,500,000 <sup>r</sup>	18,200,000 <sup>r</sup>	19,900,000

<sup>e</sup>Estimated. <sup>p</sup>Preliminary. <sup>r</sup>Revised. W Withheld to avoid disclosing company proprietary data; not included in "Total." -- Zero.

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

<sup>2</sup>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 formation of reliable estimates of output levels. Table includes data available through May 11, 2011.

<sup>3</sup>Magnesitic dolomite and brucite.

<sup>4</sup>Reported figure.