



2014 Minerals Yearbook

MAGNESIUM COMPOUNDS [ADVANCE RELEASE]

MAGNESIUM COMPOUNDS

By E. Lee Bray

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.

The leading form of magnesium compounds was caustic-calcined magnesia, which was used, in descending order of volume, in the chemical industry, agricultural supplements, and environmental applications. Domestic caustic-calcined magnesia shipments in 2014 decreased slightly from those in 2013, imports for consumption increased by 14%, and apparent consumption increased by 5% (table 1). The second-leading form of magnesium compounds was refractory magnesia, which was used for refractory products, in descending order of volume, by the steel, cement, and glass industries. U.S. production of refractory magnesia (dead-burned) in 2014 increased by 47% from that in 2013, shipments increased by 19%, and net imports for consumption increased by 12%. The volume and value of U.S. apparent consumption, production, and shipments of refractory magnesia was withheld to avoid disclosing proprietary information. The-third leading form of magnesium compounds was magnesium hydroxide, which was used for environmental applications and in the chemical industry. Domestic production of magnesium hydroxide in 2014 increased by 3% from that in 2013, exports increased by 22%, and imports increased by 19% (tables 3, 5, 7). Magnesium sulfate production increased by 5% (table 3). About 65% of U.S. magnesium compounds production came from seawater and well and lake brines. The remainder was recovered from the minerals dolomite, magnesite, and olivine. Imports made up for the shortfall in domestic production of magnesium compounds with China as the main supplier, accounting for 52% of the imports of caustic-calcined magnesia and 66% of the refractory magnesia imports (table 6).

Legislation and Government Programs

The U.S. Department of Commerce, International Trade Administration (ITA), conducted an administrative review of countervailing duties on magnesia-carbon bricks imported from China between January 1, 2012, and December 31, 2012. In October 2014, the ITA published its final determinations and established dumping margins of 66.27% ad valorem for magnesia-carbon bricks shipped by Fengchi Refractories Co. and a related company, Fengchi Import and Export Co. Ltd. of Haicheng, and 24.24% ad valorem for all other companies included in the review that shipped magnesia-carbon bricks from China during the period of review. In December, the ITA rescinded an administrative review of its antidumping duty order on imports of certain magnesia-carbon bricks from Mexico between September 1, 2013, and August 31, 2014, because the two U.S. companies, which requested the review in September 2014, withdrew their requests (U.S. Department of Commerce, International Trade Administration, 2014a, b, c).

Production

In 2014, 152,000 metric tons (t) of caustic-calcined magnesia and 187,000 t of magnesium hydroxide was shipped by domestic producers in the United States (tables 1, 3). Production data for dead-burned magnesia were withheld to avoid disclosing company proprietary data. Fused magnesia was not produced in the United States; UCM Magnesia Ltd. [a subsidiary of Imerys S.A. (Paris, France)] permanently shut down its fused magnesia plant in Cherokee, AL, in June 2013 (Imerys S.A., 2014, p. 39). Olivine Corp. processed olivine for use as foundry sand at a plant in Bellingham, WA, using stockpiled material mined in the previous year. No other company mined or processed olivine in the United States in 2014. Data for magnesium compounds were collected by the U.S. Geological Survey (USGS) from an annual voluntary survey of U.S. operations. Of the nine operations canvassed, four responded, representing approximately 80% of the magnesium compounds shipped and used, including data for some compounds that were not reportable in table 3. Data for the five nonrespondents were estimated on the basis of prior-year production levels.

Compass Minerals International, Inc. (Overland Park, KS) planned to build new solar evaporation ponds on the west side of the Great Salt Lake in Utah. Compass produced magnesium chloride, potassium sulfate, and salt from the Great Salt Lake. The project would increase production capacity of Compass's main product, potassium sulfate, by 35%, and magnesium chloride capacity could be increased if market conditions warranted. No progress was made during the year as a project schedule was pending regulatory approval and construction was not expected to begin until at least 2016. Compass sold magnesium chloride mainly for deicing and dust control applications and also for agricultural purposes, potassium sulfate for agricultural uses, and salt for deicing and chemicals (Compass Minerals International, Inc., 2015, p. 14).

Consumption

In 2014, chemical intermediates were the leading domestic end use by tonnage for caustic-calcined magnesia, accounting for 37% of the total use. The other major end-use sectors for caustic-calcined magnesia were agriculture (animal feed and fertilizers), 31%, and environmental applications (water treatment and stack-gas scrubbing), 19%. Dead-burned magnesia and fused magnesia were used for refractory products, with the steel industry being the leading end-use sector for domestic consumption. The cement and glass industries also used refractory products made from dead-burned and fused magnesia.

Magnesium hydroxide was used, in descending order, for water treatment, as a chemical intermediate, and in medicines and pharmaceuticals. Magnesium sulfate was used, in descending order, for chemicals, fertilizer, rubber, pulp and paper, pharmaceuticals, and water treatment. Magnesium chloride was used mainly for deicing, and magnesium chloride brines were used for deicing and to control road dust.

Foreign Trade

Net imports of caustic-calcined magnesia in 2014 were 12% more than those in 2013. Net imports of dead-burned and fused magnesia in 2014 were 12% more than those in 2013. China and Brazil remained the leading sources of imports of dead-burned and fused magnesia, supplying 66% and 25%, respectively. The leading sources of caustic-calcined magnesia imports remained China (52%), Canada (27%), and Australia (12%) (tables 4, 6). Net imports of magnesium chloride used for deicing nearly tripled those in 2013 owing to heavy snowfall in the northeastern United States during the first and fourth quarters of the year.

World Review

World production of crude salable magnesite increased by 3% to 29.3 million metric tons (Mt) in 2014 compared with 28.3 Mt in 2013 (table 9). The largest capacity magnesite-processing facilities in the world were in China, Turkey, and Russia, in descending order. These countries accounted for more than 84% of world production of magnesia from magnesite in 2014, with China accounting for 67% of the total. Japan, the Netherlands, and the United States together accounted for about 57% of the world's magnesia production capacity from seawater or brines (table 8). Fused magnesia was produced in Australia, Brazil, China, Iran, Israel, Japan, North Korea, the Republic of Korea, Mexico, Norway, Russia, Turkey, and the United Kingdom. At yearend 2014, world production capacity for caustic-calcined magnesia was about 3.32 million metric tons per year (Mt/yr) and capacity for dead-burned magnesia was about 8.62 Mt/yr (table 8).

Norway has been the world's principal producer and supplier of olivine. Other producers include Australia, Austria, Brazil, China, Greece, Italy, Japan, the Republic of Korea, Mexico, Spain, Taiwan, and Turkey. Production data were not available for many of these countries, and some producers may not have mined olivine in 2014 but supplied stockpiled olivine to customers. Olivine was not mined in the United States in 2014, but stockpiled olivine was processed and supplied to foundries and other consumers from a plant in Washington.

Canada.—In 2014, Karnalyte Resources Inc. (Calgary, Alberta) sought additional financing to construct a magnesium chloride and potash solution mine at Wynyard, Saskatchewan. A construction schedule was pending approval of its construction permit. In 2013, the Saskatchewan Ministry of Environment approved Karnalyte's Environmental Impact Statement and notified Karnalyte that it could proceed with the construction permitting process. Karnalyte planned to develop a carnallite-sylvite mineral deposit to produce 100,000 t/yr of magnesium chloride (MgCl₂) brine (32% MgCl₂), 104,000 t/yr of

hydromagnesite, and 625,000 t/yr of potash (Karnalyte Resources Inc., 2013a, b, 2014).

China.—Exports of caustic-calcined magnesia, dead-burned magnesia, and fused magnesia in the first half of 2014 increased by 33%, 27.9%, and 10%, respectively, compared with those of the same period in 2013. Prices were generally lower for all three grades of magnesia during the first half of 2014 compared with prices in the first half of 2013, although prices increased in the second half of 2014 as the cost for export licenses and taxes on producers increased. Steel production increased slightly during the first half of 2014, indicating that increased supply from producers in China and decreased demand from other consumers in China were responsible for the increased availability of magnesia for export. Part of the increased magnesia exports may have been owing to more accurate reporting as Government officials increased prosecution of those evading the export tax on magnesia (Lismore-Scott, 2014a; Syrett, 2014; World Steel Association, 2015a, b).

Greece.—In February, Terna Mag S.A. started exporting magnesite from its mine in Mantoudi. Magnesite had not been mined in the Mantoudi region in the last 15 years but Terna was investing €100 million to revive mining in the region. In addition to a 14,400-t/yr shaft kiln that produced caustic-calcined magnesia, a 60,000-t/yr Herreshoff kiln was rebuilt to produce dead-burned magnesia (Hughes and Lismore-Scott, 2014).

Norway.—RHI AG (Vienna, Austria) restarted an 80,000-t/yr fused magnesia plant in Porsgrunn that had been damaged by an overspill of 1 of the 10 furnaces, forcing the entire plant to shut down in 2012. Because of low prices for fused magnesia, production volumes were reduced by an unspecified amount. The plant used magnesia recovered from seawater as its feedstock (Ollett, 2013; RHI AG, 2013a; 2015, p. 40).

Russia.—In July, Magnezit Group (Moscow) completed construction of a 100,000-t/yr multiple-hearth furnace in Satka to produce dead-burned magnesia, increasing the plant's dead-burned magnesia capacity to 130,000 t/yr. Completion of five electric fusion furnaces, each with a capacity of 10,000 t/yr of fused magnesia, was expected in 2015 (Lismore-Scott, 2014b; Magnezit Group, 2014).

In the first quarter of the year, Nikochem LLC (Volgograd) completed ramping up the 5,000-t/yr magnesium hydroxide plant that had been commissioned in November 2013. Expansion to 7,500 t/yr was planned to be completed in early 2015. Nikochem also planned to construct a 50,000-t/yr fused magnesia plant. Nikochem produced bischofite from deposits near Volgograd as its feedstock (Lismore, 2013; O'Driscoll, 2013; Nikochem LLC, 2014).

Spain.—Magnesitas Navarras S.A. (Navarra) was applying for licenses to mine magnesite from the Borobia and Zibeti deposits, having reported reserves of 50 Mt and 7 Mt, respectively, of contained magnesite. Magnesite from the mines would be used to produce dead-burned magnesia at a plant in Zubiri (Wilson, 2013; Nicoletopoulos, 2014).

Turkey.—Kümaş Manyezit Sanayi A.Ş. (Kutahya) completed two new fused magnesia furnaces at its Kutahya plant. The expansion doubled its fused magnesia capacity to 35,000 t/yr from 17,500 t/yr (Kümaş Manyezit Sanayi A.Ş., 2015).

In April, RHI completed the acquisition of a magnesite mine and adjacent processing facilities in Erzurum from Cihan Group. RHI planned to reopen the mine and expand and modernize the plant, increasing sintered magnesia capacity to 100,000 t/yr from 60,000 t/yr (RHI AG, 2013b, 2014; Syrett, 2013).

Outlook

According to the World Steel Association (2015c), world crude steel production, the leading end use for magnesia, reached a record 1.7 billion metric tons in 2014, an increase of 1.2% compared with that of 2013. China continued to be the leading steel-producing nation, accounting for 49.5% of the global total in 2014.

The global supply of magnesia and magnesium compounds is expected to be sufficient to meet global demand for the next few years. Magnesia exports from China are expected to increase in 2015 as China's magnesia production exceeds the consumption by the steel and other commodity industries that require refractory products. In addition, by 2018, the steel industry in China has set a goal to reduce unit consumption of refractory magnesia to 15 kilograms per metric ton (kg/t) of steel produced from the current rate of 23 kg/t of steel produced (Moore, 2014). If this target is achieved, less demand for magnesia refractory products is expected, even if steel production in China increases. Production of cement, glass, and steel could decrease in China as the Government of China enforces policies to close older, less efficient capacity in order to reduce emissions, which would result in less magnesia consumption in China. Magnesia consumption in Europe is expected to remain at levels significantly lower than the peak in 2007 as steel production is expected to remain depressed for several years. Development of magnesite deposits in Australia and Canada and recent expansion of processing capacity in Australia, Brazil, Iran, the Netherlands, Norway, Russia, and Turkey are expected to increase supplies of magnesium compounds outside of China. The trend of establishing captive supplies of magnesium compounds by refractory producers is expected to continue as manufacturers seek to lessen dependence on outside suppliers.

Increased consumption of caustic-calcined magnesia as a feed supplement and fertilizer additive is expected as the nutrient value of magnesium gains more attention. Developing countries such as Brazil and China are expected to have the largest increase in consumption of caustic-calcined magnesia for agricultural uses. By 2020, global consumption of caustic-calcined magnesia in animal feed is expected to increase to 600,000 t/yr from 470,000 t/yr in 2014, a 28% increase. Consumption of magnesium hydroxide for water treatment is expected to increase and water treatment is expected to continue as the leading end use of magnesium hydroxide. Use as a flame retardant, the second-leading end use of magnesium hydroxide, is expected to continue to increase because of concerns about the corrosiveness and toxicity of smoke and other emission products from plastics containing halogenated flame retardants (Industrial Minerals, 2014).

Carbon sequestration is gaining world attention as a method to reduce greenhouse gas emissions. Magnesium-based minerals, particularly brucite and olivine, are being investigated as minerals that are naturally capable of sequestering carbon

dioxide emitted by burning fossil fuels and other human activities and transforming the gas into a geologically stable carbonate. If this technology were to be developed commercially, it could represent a significant new market for these minerals.

References Cited

- Compass Minerals International, Inc., 2015, 2014 annual report: Overland Park, KS, Compass Minerals International, Inc., 75 p. (Accessed June 9, 2015, via <http://phx.corporate-ir.net/phoenix.zhtml?c=148615&p=irol-reportsAnnual>.)
- Hughes, Emma, and Lismore-Scott, Siobhan, 2014, Terna Mag ships first magnesite order from Kymassi Port in Greece: Industrial Minerals, no. 558, March, p. 11.
- Imerys S.A., 2014, 2013 registration document annual financial report: Paris, France, Imerys S.A., April 17, 308 p. (Accessed June 9, 2015, via <http://www.imerys.com/Scopi/Group/imeryscom/imeryscom.nsf/pagesref/SCOI-8S4EYJ?opendocument&lang=en&publi=5>.)
- Industrial Minerals, 2014, Magnesia products under the radar: Industrial Minerals, no. 561, June, p. 57–58.
- Karnalyte Resources Inc., 2013a, Karnalyte Resources Inc. authorized to proceed to construction permitting process for Wynyard carnallite project: Calgary, Alberta, Canada, Karnalyte Resources Inc. press release, September 19. (Accessed June 19, 2014, at http://www.karnalyte.com/investors/press_releases/2013/index.php?&content_id=83.)
- Karnalyte Resources Inc., 2013b, Karnalyte Resources receives environmental impact statement approval for Wynyard carnallite project: Calgary, Alberta, Canada, Karnalyte Resources Inc. press release, February 11. (Accessed June 19, 2014, at http://www.karnalyte.com/investors/press_releases/2013/index.php?&content_id=56.)
- Karnalyte Resources Inc., 2014, Karnalyte Resources Inc. announces appointment of chief executive officer, directors and third quarter 2014 results: Calgary, Alberta, Canada, Karnalyte Resources Inc. press release, November 14. (Accessed June 17, 2015, at http://www.karnalyte.com/investors/press_releases/2014/index.php?&content_id=103.)
- Kümaş Manyezit Sanayi A.Ş., 2015, Kumas—Capitalising on vertical integration in refractories: Kutahya, Turkey, Kümaş Manyezit Sanayi A.Ş. press release, May 29. (Accessed July 1, 2015, at http://www.metec-tradefair.com/cipp/md_gmtm/custom/pub/content/oid,151000/lang,2/ticket.g_u_e_s_t/~Kumas_Capitalising_on_vertical_integration_in_refractories.html.)
- Lismore, Siobhan, 2013, Nikochem eyes global CIS market for Mg(OH)₂: Industrial Minerals, May 15. (Accessed May 15, 2013, via <http://www.indmin.com/>.)
- Lismore-Scott, Siobhan, 2014a, China magnesia exports increase in H1 2014: Industrial Minerals, no. 564, September, p. 28–29.
- Lismore-Scott, Siobhan, 2014b, Magnezit pushes on with refractory overhaul: Industrial Minerals, no. 563, August, p. 21.
- Magnezit Group, 2014, Magnezit Group completes a large-scale investment project amounting to more than 3 billion rubles: Moscow, Russia, Magnezit Group press release, July 16. (Accessed June 17, 2015, at <http://magnezit.ru/en/about/press/news/index.php?id4=903>.)
- Moore, Simon, 2014, Chinese steel consumption rates to dictate global refractory future: Industrial Minerals, January, no. 556, p. 20.
- Nicoletopoulos, Vasili, 2014, Burning up, a look at the deadburned magnesia market: Industrial Minerals, no. 561, June, p. 47–56.
- Nikochem LLC, 2014, Representatives of Nikochem LLC have attended the Cables 2014 conference (Germany): Volgograd, Russia, Nikochem LLC news release, March 21. (Accessed July 1, 2015, at <http://www.nikochem.com/en/news/item/2129>.)
- O'Driscoll, Mike, 2013, Russian magnesium hydroxide plant nears start-up: Industrial Minerals, October 25. (Accessed November 21, 2013, via <http://www.indmin.com/>.)
- Ollett, John, 2013, RHI Norwegian fused magnesia plant shuts down for repairs: Industrial Minerals, January 30. (Accessed January 30, 2013, via <http://www.indmin.com/>.)
- RHI AG, 2013a, RHI expects positive contribution to earnings from starting up fusing lines in Norway as of the second quarter and confirms guidance for 2013: Vienna, Austria, RHI AG press release, January 23. (Accessed May 21, 2014, at http://www.rhi-ag.com/internet_en/investor_relations_en/22120/23.01.13_-_Norwegen.html.)

RHI AG, 2013b, RHI is on the verge of acquiring magnesite mining rights including existing production facilities in Turkey: Vienna, Austria, RHI AG press release, August 19. (Accessed May 21, 2014, at http://www.rhi-ag.com/internet_en/investor_relations_en/68988/19.08.13_Turkey.html.)

RHI AG, 2014, RHI signs contract to acquire a raw material plant and mining rights in Turkey: Vienna, Austria, RHI AG press release, April 7. (Accessed August 7, 2014, at http://www.rhi-ag.com/internet_en/investor_relations_en/78502/07.04.14_-_Turkey.html.)

RHI AG, 2015, Annual report 2014: Vienna, Austria, RHI AG, 172 p. (Accessed June 17, 2015, at http://ogb.rhi-ag.com/RHI_GB_2014_E/.)

Syrett, Laura, 2013, RHI poised to secure magnesite mining rights in Turkey: Industrial Minerals, August 20. (Accessed August 23, 2013, via <http://www.indmin.com/>.)

Syrett, Laura, 2014, Potash and barite supply tightens while fused magnesia faces overcapacity: Industrial Minerals, no. 566, November, p. 56–58.

U.S. Department of Commerce, International Trade Administration, 2014a, Certain magnesia carbon bricks from Mexico—Rescission of antidumping duty administrative review; 2013–2014: Federal Register, v. 79, no. 238, December 11, p. 73544–73545.

U.S. Department of Commerce, International Trade Administration, 2014b, Certain magnesia carbon bricks from the People’s Republic of China—Final results and final rescission, in part, of countervailing duty administrative review; 2012: Federal Register, v. 79, no. 200, October 16, p. 62101–62103.

U.S. Department of Commerce, International Trade Administration, 2014c, Certain magnesia carbon bricks from the People’s Republic of China—Preliminary results of countervailing duty administrative review; 2012: Federal Register, v. 79, no. 110, June 9, p. 32915–32917.

Wilson, Ian, 2013, Global update on magnesite resources and production: Industrial Minerals, no. 522, September, p. 56–64.

World Steel Association, 2015a, Monthly crude steel production 2013: Brussels, Belgium, World Steel Association, January 22, 1 p. (Accessed June 24, 2015, via <http://www.worldsteel.org/statistics/statistics-archive/steel-archive.html>.)

World Steel Association, 2015b, Monthly crude steel production 2014: Brussels, Belgium, World Steel Association, January 22, 1 p. (Accessed June 24, 2015, via <http://www.worldsteel.org/statistics/statistics-archive/steel-archive.html>.)

World Steel Association, 2015c, World crude steel output increases by 1.2% in 2014: Brussels, Belgium, World Steel Association, January 22. (Accessed June 18, 2015, at <http://www.worldsteel.org/media-centre/press-releases/2015/World-crude-steel-output-increases-by-1.2--in-2014.html>.)

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

Historical Statistics for Mineral and Material 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.

Mapping the Mineral Resource Base for Mineral Carbon-Dioxide Sequestration in the Conterminous United States. Data Series 414, 2009.

Other

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 (11th ed.). Roskill Information Services Ltd., 2010.

TABLE 1
SALIENT MAGNESIUM COMPOUND STATISTICS¹

(Thousand metric tons and thousand dollars)

	2010	2011	2012	2013	2014
United States:					
Caustic-calcined and specified magnesias: ²					
Shipped by producers: ³					
Quantity	162	155	152	155	152
Value	47,000	48,800	46,000	47,700	57,700
Exports ⁴	(5)	(5)	(5)	1	3
Imports for consumption ⁴	127	111	114	133	151
Refractory magnesia:					
Shipped by producers:					
Quantity	W	W	W	W	W
Value	W	W	W	W	W
Exports	9	18	16	19	21
Imports for consumption	323	384	292	215	241
World, production of magnesite	21,600 ^r	27,800 ^r	24,200 ^{r,c}	28,300 ^{r,c}	29,300 ^c

^rEstimated. ^rRevised. 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.

³Includes magnesia used by producers.

⁴Caustic-calcined magnesia only.

⁵Less than ½ unit.

TABLE 2
U.S. MAGNESIUM COMPOUND PRODUCERS, BY RAW MATERIAL SOURCE, LOCATION, AND PRODUCTION CAPACITY, IN 2014¹

(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	250,000	Magnesium chloride and magnesium chloride brines.
Intrepid Wendover-Potash, LLC	Wendover, UT	45,000	Magnesium chloride brines.
Well brines, Martin Marietta Magnesia Specialties, LLC	Manistee, MI	314,000	Caustic-calcined magnesia, dead-burned magnesia, and magnesium hydroxide.
Seawater:			
South Bay Salt Works	Chula Vista, CA	3,000	Magnesium chloride brines.
SPI Pharma, Inc.	Lewes, DE	5,000	Magnesium hydroxide.
Total		757,000	

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

TABLE 3
U.S. MAGNESIUM COMPOUNDS SHIPPED BY PRODUCERS¹

	2013		2014	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Caustic-calcined and specified (USP and technical) magnesias ²	155,000	\$47,700	152,000	\$57,700
Magnesium hydroxide [100% Mg(OH) ₂] ²	182,000	86,600	187,000	88,900
Magnesium sulfate, anhydrous and hydrous	47,400	22,500	49,600	23,800
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 MAGNESIA AND CRUDE MAGNESITE, BY COUNTRY¹

Material and country	2013		2014	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Caustic-calcined magnesia:				
Canada	1,030	\$525	1,790	\$911
Indonesia	84	81	75	83
Korea, Republic of	76	68	171	158
Mexico	176	117	2	4
Netherlands	--	--	263	164
Poland	--	--	120	120
Spain	--	--	116	121
Taiwan	--	--	299	207
Other	106 ^r	81 ^r	293	241
Total	1,470	872	3,130	2,010
Dead-burned and fused magnesia:				
Brazil	81	195	--	--
Canada	3,510	1,440	2,930	2,280
China	191	343	232	331
Germany	999	924	907	837
Korea, Republic of	152	142	--	--
Mexico	558	557	2,040	1,040
Saudi Arabia	15	49	43	71
South Africa	10,100	6,030	11,600	6,890
Taiwan	1,570	1,410	1,750	1,660
Turkey	138	157	100	114
Venezuela	270	161	--	--
Other	1,380	1,770	1,240	1,760
Total	18,900	13,200	20,800	15,000
Other magnesia:				
Brazil	348	449	312	394
Canada	3,370	3,330	2,990	2,580
China	866	1,710	941	1,090
France	1,190	822	1,170	865
Germany	707	621	1,380	1,800
India	781	905	242	302
Korea, Republic of	568	599	650	686
Mexico	1,490	1,080	513	1,020
Netherlands	706	475	1,160	910
Spain	--	--	77	81
Taiwan	587	624	336	332
United Kingdom	927	886	2,090	1,820
Other	2,410 ^r	3,840 ^r	2,690	4,160
Total	14,000	15,300	14,500	16,000
Crude magnesite:				
Brazil	39	39	42	80
Canada	112	86	174	128
Germany	1	4	17	79
Iceland	288	272	184	210
Mexico	53	54	19	39
Panama	67	155	37	77
Spain	60	70	137	148
Trinidad and Tobago	11	15	25	32
United Kingdom	191	184	67	71
Venezuela	2	4	16	39
Other	57 ^r	109 ^r	52	92
Total	881	992	770	995

^rRevised. -- 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	2013		2014		Principal destinations in 2014
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	
Magnesium chloride, anhydrous and other	8,850	\$6,400	10,300	\$6,810	Canada, 88%.
Magnesium hydroxide and peroxide	22,100	17,300	26,900	21,100	Canada, 50%; Sweden, 13%; Mexico, 11%.
Magnesium sulfate, natural kieserite and epsom salts	295	295	176	298	Canada, 49%; Mexico, 27%.
Magnesium sulfate, other	10,200	4,320	8,770	4,110	Canada, 89%.

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

Source: U.S. Census Bureau.

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

Material and country	2013		2014	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Caustic-calcined magnesia:				
Australia	20,600	\$6,150	18,100	\$5,830
Brazil	2,560	854	11,300	2,960
Canada	36,900	16,900	40,900	18,500
China	71,500	17,200	78,400	17,800
Hong Kong	1,080	292	--	--
Israel	784	143	1,280	234
Japan	--	--	1,150	2,540
Slovakia	--	--	127	70
Other	50	69	162	102
Total	133,000	41,600	151,000	48,100
Dead-burned and fused magnesia:				
Australia	4,510	2,330	--	--
Austria	4,660	2,210	18	37
Brazil	68,600	32,200	60,900	27,700
China	106,000	78,500	160,000	99,200
France	131	983	201	1,570
Germany	255	311	42	93
Greece	1,700	836	978	560
Israel	2,560	8,470	2,060	6,690
Japan	2,280	5,720	1,450	3,730
Mexico	349	442	1,020	1,100
Netherlands	73	78	110	111
Russia	--	--	57	60
Spain	7,060	2,330	5,170	1,720
Turkey	14,900	8,860	7,700	3,550
United Kingdom	721	1,280	859	1,480
Other	690 [†]	303 [†]	625	260
Total	215,000	145,000	241,000	148,000
Other magnesia:				
Australia	1,320	1,060	761	374
Brazil	7,970	2,570	13,000	3,610
China	8,910	3,270	11,700	4,560
France	132	449	149	505
Israel	1,640	4,510	1,940	5,200
Japan	902	2,370	1,130	2,690
Mexico	3,690	3,990	4,340	4,530
Slovakia	997	428	1,710	645
Spain	265	116	2	5
United Kingdom	16	218	379	691
Other	88 [†]	171 [†]	486	366
Total	25,900	19,100	35,600	23,200
Crude magnesite:				
Brazil	320	498	340	516
China	6,550	896	17,300	2,010
Hong Kong	2,920	759	--	--
Israel	265	836	114	359
Italy	282	77	119	32
Japan	496	882	236	707
United Kingdom	259	682	--	--
Other	210 [†]	164 [†]	230	169
Total	11,300	4,790	18,400	3,790

[†]Revised. -- 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

Material	2013		2014		Principal sources in 2014
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	
Magnesium chloride, anhydrous and other	47,800	\$13,800	118,000	\$31,100	Israel, 68%; Netherlands, 28%.
Magnesium hydroxide and peroxide	5,730	15,200	6,800	16,100	Mexico, 25%; Israel, 22%; Austria, 21%.
Magnesium sulfate, natural epsom salts	2,220	1,040	3,040	1,050	China, 97%.
Magnesium sulfate, natural kieserite	58,600	1,860	45,700	1,920	Germany, 97; China, 3%.
Magnesium sulfate, other	32,400	16,600	30,300	15,300	China, 39%; Germany, 28%; Mexico, 17%.

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, 2014^{1,2}

(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	380	12	--	488
Canada	100	--	--	--	100
China	1,440	2,740	--	--	4,180
France	--	--	30	--	30
Greece	90	110	--	--	200
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	205	215
Norway	--	--	30	--	30
Poland	--	10	--	--	10
Russia	380	2,500	--	--	2,880
Saudi Arabia	39	32	--	--	71
Serbia	--	35	--	--	35
Slovakia	--	465	--	--	465
South Africa	12	--	--	--	12
Spain	150	70	--	--	220
Turkey	106	544	--	--	650
Ukraine	--	170	20	80	270
United States	140	--	191	195	526
Total	2,940	7,730	378	885	12,000

-- 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	2010	2011	2012 ^c	2013 ^c	2014 ^c
Australia	275,000	640,000 ^c	587,000	450,000	500,000
Austria	757,063	867,912	778,810 ³	714,422 ^{r,3}	750,000
Brazil	483,882	476,805	480,000	520,000 ^r	600,000
Canada ^{e,4}	150,000	150,000	150,000 ^r	150,000	150,000
China ^e	14,000,000	19,000,000	16,000,000	20,000,000	20,500,000
Greece	396,000	541,813	281,000 ^{r,3}	337,600 ^{r,3}	360,000
Guatemala	--	311	27,132 ³	17,196 ³	20,000
India ^e	301,000	236,000	224,000	213,000	225,000
Iran ⁵	126,702	172,697 ³	130,000 ^r	126,000 ^r	130,000
Korea, North ^e	150,000	254,000	178,000	250,000	250,000
Pakistan ⁴	5,159	4,908	9,842 ^{r,3}	5,708 ^{r,3}	5,000
Poland ⁵	108,809 ^r	129,166 ^{r,3}	129,641 ^{r,3}	130,000 ^r	130,000
Russia ^e	1,200,000	1,200,000	1,300,000	1,370,000 ^r	1,500,000
Saudi Arabia ⁵	24,993 ³	159,284 ³	39,000 ³	62,000	76,000
Serbia	24,000	24,000	24,000	24,000	24,000
Slovakia ^e	800,000	800,000	600,000	700,000	700,000
South Africa ^e	27,700	31,900	31,000	31,000	30,000
Spain ⁵	410,000 ^r	500,000 ^r	649,937 ^{r,3}	643,827 ^{r,3}	650,000
Turkey	2,316,763	2,588,276	2,560,000 ^r	2,600,000 ^r	2,700,000
United States	W	W	W	W	W
Total	21,600,000 ^r	27,800,000 ^r	24,200,000 ^r	28,300,000 ^r	29,300,000

^cEstimated. ^rRevised. W Withheld to avoid disclosing company proprietary data; not included in "Total." -- Zero.

¹World totals 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 formation of reliable estimates of output levels.

Includes data available through July 22, 2015.

³Reported figure.

⁴Magnesite dolomite and brucite.

⁵Magnesite consumed estimate based on reported production of caustic calcined or deadburned magnesite, unless denoted as reported. Consumption may have been from stockpiled magnesite.