

## MAGNESIUM COMPOUNDS<sup>1</sup>

(Data in thousand metric tons of magnesium content unless otherwise noted)

**Domestic Production and Use:** Seawater and natural brines accounted for about 63% of U.S. magnesium compounds production in 2015. The value of production of magnesium compounds, excluding dead-burned magnesia, was \$137 million. Magnesium oxide and other compounds were recovered from seawater by one company in California and another company in Delaware; from well brines by one company in Michigan; and from lake brines by two companies in Utah. Magnesite was mined by one company in Nevada. One company in Washington processed stockpiled olivine that was previously mined. About 54% of the magnesium compounds consumed in the United States were used in agricultural, chemical, construction, environmental, and industrial applications in the form of caustic-calcined magnesia, magnesium chloride, magnesium hydroxide, and magnesium sulfates. The remaining 46% was used for refractories in the form of dead-burned magnesia, fused magnesia, and olivine.

<b>Salient Statistics—United States:</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015<sup>e</sup></b>
Production	306	244	297	288	295
Imports for consumption	316	260	230	258	265
Exports	20	19	21	23	30
Consumption, apparent	602	485	506	523	520
Employment, plant, <sup>2</sup> number <sup>e</sup>	300	275	250	250	260
Net import reliance <sup>2</sup> as a percentage of apparent consumption	49	50	41	45	43

**Recycling:** Some magnesia-based refractories are recycled, either for reuse as refractory material or for use as construction aggregate.

**Import Sources (2011–14):** China, 54%; Brazil, 14%; Canada, 9%; Australia, 6%; and other, 17%.

<b>Tariff:<sup>3</sup> Item</b>	<b>Number</b>	<b>Normal Trade Relations 12–31–15</b>
Crude magnesite	2519.10.0000	Free.
Dead-burned and fused magnesia	2519.90.1000	Free.
Caustic-calcined magnesia	2519.90.2000	Free.
Kieserite	2530.20.1000	Free.
Epsom salts	2530.20.2000	Free.
Magnesium hydroxide	2816.10.0000	3.1% ad val.
Magnesium chloride	2827.31.0000	1.5% ad val.
Magnesium sulfate (synthetic)	2833.21.0000	3.7% ad val.

**Depletion Allowance:** Brucite, 10% (Domestic and foreign); dolomite, magnesite, and magnesium carbonate, 14% (Domestic and foreign); magnesium chloride (from brine wells), 5% (Domestic and foreign); and olivine, 22% (Domestic) and 14% (Foreign).

**Government Stockpile:** None.

**Events, Trends, and Issues:** Global consumption of dead-burned and fused magnesia declined slightly during the first 8 months of 2015 compared with that in the same period of 2014, owing to a 7% decline in China's steel production and an overall slight decrease in global steel production during the same comparative periods. The reduced consumption and an increase in capacity in China resulted in an increase in the amount of magnesia in China available for export. The resulting lower prices for magnesia products from China put pressure on other producers to also lower prices. As a result, prices for magnesia declined throughout the first half of 2015; caustic-calcined magnesia prices did not decrease as much as those of dead-burned magnesia and fused magnesia.

In recent years, fused magnesia has replaced dead-burned magnesia in some steel furnaces, and this trend is expected to continue as more fused magnesia capacity comes on line. Fused magnesia has superior properties to dead-burned magnesia in some refractory applications, owing to higher magnesia content, higher density, and larger crystal size.

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Although fused magnesia costs more than dead-burned magnesia, its longer campaign life reduces downtime, lowering the overall cost of production. The steel industry in China was expected to continue to become more efficient in its use of refractories, which would result in less magnesia consumed per unit of steel produced.

Domestic consumption of dead-burned magnesia decreased as the use of higher quality fused-magnesia refractories increased and crude steel production in the United States decreased by 9% in 2015. Consumption of caustic-calcined magnesia continued to increase for animal feed supplements and fertilizer as the importance of magnesium as a nutrient gained recognition. Environmental applications, such as flue gas treatment and wastewater treatment, also accounted for increasing consumption of magnesium compounds, including caustic-calcined magnesia and magnesium hydroxide. Deicing and dust control have increased consumption of magnesium chloride in recent years.

New capacity in China was expected to be limited because concerns about overcapacity deter further investment in the magnesia industry. New capacity in other countries, such as Russia and Turkey, was expected to be completed as planned, but further expansions were less likely, especially for dead-burned magnesia.

### World Magnesite Mine Production and Reserves:

	Mine production		Reserves <sup>4</sup>
	2014	2015 <sup>e</sup>	
United States	W	W	10,000
Australia	145	120	95,000
Austria	215	220	15,000
Brazil	175	175	86,000
China	5,910	5,770	500,000
Greece	105	115	80,000
India	65	70	26,000
Korea, North	70	70	450,000
Russia	375	375	650,000
Slovakia	200	200	35,000
Spain	185	200	10,000
Turkey	780	800	111,000
Other countries	190	180	390,000
World total (rounded)	<sup>5</sup> 8,420	<sup>5</sup> 8,300	2,400,000

In addition to magnesite, vast reserves exist of well and lake brines and seawater from which magnesium compounds can be recovered.

**World Resources:** Resources from which magnesium compounds can be recovered range from large to virtually unlimited and are globally widespread. Identified world magnesite and brucite resources total 12 billion tons and several million tons, respectively. Resources of dolomite, forsterite, magnesium-bearing evaporite minerals, and magnesia-bearing brines are estimated to constitute a resource of billions of tons. Magnesium hydroxide can be recovered from seawater.

**Substitutes:** Alumina, chromite, and silica substitute for magnesia in some refractory applications.

<sup>e</sup>Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data.

<sup>1</sup>See also Magnesium Metal.

<sup>2</sup>Defined as imports – exports + adjustments.

<sup>3</sup>Tariffs are based on gross weight.

<sup>4</sup>See [Appendix C](#) for resource/reserve definitions and information concerning data sources.

<sup>5</sup>Excludes U.S. production.