

## 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 69% of U.S. magnesium compounds production in 2014. Magnesium compound production was valued at \$251 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, and olivine was mined by one company in Washington. About 52% of the magnesium compounds consumed in the United States was used in agricultural, chemical, construction, environmental, and industrial applications. The remaining 48% was used for refractories.

<b>Salient Statistics—United States:</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014<sup>e</sup></b>
Production	261	306	244	297	320
Imports for consumption	279	316	260	230	270
Exports	16	20	19	21	24
Consumption, apparent	524	602	485	506	570
Stocks, producer, yearend	NA	NA	NA	NA	NA
Employment, plant, number <sup>e</sup>	300	300	275	250	250
Net import reliance <sup>2</sup> as a percentage of apparent consumption	50	49	50	41	43

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

**Import Sources (2010–13):** China, 54%; Brazil, 11%; Australia, 8%; Canada, 8%; and other, 19%.

<b>Tariff:<sup>3</sup> Item</b>	<b>Number</b>	<b>Normal Trade Relations 12–31–14</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:** Historically, the majority of magnesium compounds consumed in the United States was for refractory products. Since 2013, however, refractories have accounted for less than 50% of magnesium compounds consumed. Although steel production in the United States increased slightly in 2014, the use of higher quality fused-magnesia refractories resulted in decreased refractory consumption per unit of steel produced. Increased consumption of magnesium compounds for animal feed supplements, deicing, dust control, fertilizer, flue gas treatment, and waste water treatment also contributes to the shift in end use distribution.

Global consumption of all refractories was 10% lower in 2013 than that in 2011. Magnesia brick consumption in China in 2013 was 16% lower than that in 2012. The decrease in consumption was partially attributed to slower economic growth in China and the Government of China ordering older, inefficient capacity in the steel, cement, and glass industries to be shut down. In addition, production of higher quality refractories that last longer also decreased consumption of magnesia. Dead-burned magnesia was being replaced with fused magnesia in some steel furnaces. 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 the trends of more efficient use of refractory products and slower growth in China were expected to continue, concerns about the availability of raw materials have lead several refractory producers to secure captive sources of magnesite in recent years. Further consumer acquisitions of raw-material suppliers were expected. New or reopened production capacity has provided consumers with an alternative to fused magnesite produced in China. A magnesite mine in Greece that had been shut down for about 15 years was reopened in late 2013 and began shipping magnesite in 2014. The plant had a capacity to produce 15,000 metric tons per year of caustic calcined magnesite and was building a 60,000-ton-per-year kiln. In Russia, the leading magnesite producer commissioned a new fused magnesite furnace with a capacity of 50,000 tons per year.

### World Magnesite Mine Production and Reserves:

	Mine production		Reserves <sup>4</sup>
	2013	2014 <sup>e</sup>	
United States	W	W	10,000
Australia	130	130	95,000
Austria	220	200	15,000
Brazil	140	150	86,000
China	4,900	4,900	500,000
Greece	100	115	80,000
India	60	60	20,000
Korea, North	70	80	450,000
Russia	370	400	650,000
Slovakia	200	200	35,000
Spain	280	280	10,000
Turkey	300	300	49,000
Other countries	130	150	390,000
World total (rounded)	<sup>5</sup> 6,910	<sup>5</sup> 6,970	2,400,000

In addition to magnesite, there are vast reserves 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 resources of magnesite total 12 billion tons, and of brucite, several million tons. Resources of dolomite, forsterite, magnesium-bearing evaporite minerals, and magnesite-bearing brines are estimated to constitute a resource in billions of tons. Magnesium hydroxide can be recovered from seawater.

**Substitutes:** Alumina, chromite, and silica substitute for magnesite 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 for Government and industry stock changes.

<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.