

MAGNESIUM COMPOUNDS¹

[Data in thousand metric tons of contained magnesium oxide (MgO) unless otherwise noted]²

Domestic Production and Use: Seawater and natural brines accounted for about 64% of U.S. magnesium compound production in 2021. The value of shipments of all types of magnesium compounds was estimated to be \$390 million, a 7% increase from the revised value in 2020. 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.

In the United States, about 78% of magnesium compounds were consumed in the form of caustic-calcined magnesia, magnesium chloride, magnesium hydroxide, and magnesium sulfates across the following industries and uses, in descending order, environmental, agricultural, chemical, and deicing. The remaining magnesium compounds were consumed for refractories in the form of dead-burned magnesia, fused magnesia, and olivine. Across all industries, the leading magnesium compounds consumed, in descending order, were magnesium oxide (caustic-calcined magnesia, dead burned magnesia, and fused magnesia), magnesium hydroxide, and magnesium chloride.

Salient Statistics—United States:

	2017	2018	2019	2020	2021^e
Production	438	405	376	363	390
Shipments (gross weight)	616	610	563	547	590
Imports for consumption	436	551	564	480	560
Exports	103	116	88	66	90
Consumption, apparent ³	771	840	852	777	860
Employment, plant, number ^e	260	270	270	260	270
Net import reliance ⁴ as a percentage of apparent consumption	43	52	56	53	55

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

Import Sources (2017–20): Caustic-calcined magnesia: China,⁵ 71%; Canada, 20%; Israel, 4%; Australia, 3%; and other, 2%. Crude magnesite: China,⁵ 86%; Singapore, 11%; Pakistan, 2%; and other, 1%. Dead-burned and fused magnesia: China,⁵ 69%; Brazil, 13%; Turkey, 5%; Mexico, 4%; and other, 9%. Magnesium chloride: Israel, 63%; the Netherlands, 23%; China,⁵ 5%; India, 3%; and other, 6%. Magnesium hydroxide: Mexico, 54%; the Netherlands, 15%; Israel, 11%; Austria, 9%; and other, 11%. Magnesium sulfates: China,⁵ 58%; India, 14%; Germany, 10%; Canada, 5%; and other, 13%. Total imports: China,⁵ 56%; Brazil, 10%; Israel, 10%; Canada, 7%; and other, 17%.

Tariff:	Item	Number	Normal Trade Relations 12–31–21
	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 and peroxide	2816.10.0000	3.1% ad valorem.
	Magnesium chloride	2827.31.0000	1.5% ad valorem.
	Magnesium sulfate (synthetic)	2833.21.0000	3.7% ad valorem.

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: In 2021, consumption of dead-burned and fused magnesia increased in the United States and globally by an estimated 20% and 8%, respectively, compared with that in 2020, as the demand for steel recovers from disruptions caused by the COVID-19 pandemic. Demand, and subsequent consumption, for all magnesium compounds has increased following the general trend of the manufacturing industry.

MAGNESIUM COMPOUNDS

An Austria-based magnesia and refractories producer sold two of its magnesia product subsidiaries to a private equity firm. The subsidiaries, located in Ireland and Norway, produced magnesia-based products used in the agricultural, environmental, hydrometallurgical, pulp and paper, and refractory industries.

A Turkish steelmaker purchased one of Turkey's largest magnesite producers that was a major regional and international source of magnesite. The magnesite producer holds more than 40% of Turkey's magnesite reserves and operates three plants with an annual capacity of 1.2 million tons. The purchase of the magnesite producer will provide refractory materials vital to its steelmaking process.

China remains the leading producer of magnesia and magnesite and was the principal exporter of magnesia to the United States and much of the world. As demand was beginning to recover, supply and shipping constraints were adversely affecting the availability of imported sources of magnesia. In China, power-intensive activities such as mineral processing were adversely affected by power outages resulting from a resurging demand for power, coal shortages, and newly enforced emission standards. The resulting decreased magnesia supply in China affected prices and availability of all grades of magnesia in the world market.

World Magnesite Mine Production and Reserves:⁶ In addition to magnesite, vast reserves exist in well and lake brines and seawater from which magnesium compounds can be recovered. Reserves for Australia and Turkey were revised based on information from Government and industry sources.

	Mine production ⁶		Reserves ⁷
	2020	2021	
United States	W	W	35,000
Australia	700	770	⁸ 290,000
Austria	790	870	49,000
Brazil	1,800	2,000	200,000
China	19,000	21,000	1,000,000
Greece	500	550	280,000
Russia	1,000	1,100	2,300,000
Slovakia	480	530	370,000
Spain	650	720	35,000
Turkey	1,470	1,600	110,000
Other countries	920	1000	2,600,000
World total (rounded)	⁹ 27,000	⁹ 30,000	7,200,000

World Resources:⁷ 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 13 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. Serpentine could be used as a source of magnesia but global resources, including in tailings of asbestos mines, have not been quantified but are thought to be very large.

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

⁶Estimated. W Withheld to avoid disclosing company proprietary data.

¹See also Magnesium Metal.

²Reported as magnesium content through Mineral Commodity Summaries 2016. Based on input from consumers, producers, and others involved in the industry, reporting magnesium compound data in terms of contained magnesium oxide was determined to be more useful than reporting in terms of magnesium content. Calculations were made using the following magnesium oxide (MgO) contents: magnesite, 47.8%; magnesium chloride, 42.3%; magnesium hydroxide, 69.1%; and magnesium sulfate, 33.5%.

³Defined as production + imports – exports.

⁴Defined as imports – exports.

⁵Includes Hong Kong.

⁶Gross weight of magnesite (magnesium carbonate) in thousand tons.

⁷See Appendix C for resource and reserve definitions and information concerning data sources.

⁸For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 37 million tons.

⁹Excludes U.S. production.