MAGNESIUM COMPOUNDS[1]

[Data in thousand metric tons, magnesium oxide (MgO) content,[2] unless otherwise specified]

Domestic Production and Use: In 2023, the majority of U.S. magnesium compounds were produced from seawater and natural brines. The value of shipments of all types of magnesium compounds was estimated to be $470 million, a slight increase from the revised value in 2022. Magnesium 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. Olivine was mined and processed by one company in Washington.

In the United States, about 75% 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 of quantity, environmental, chemical, agricultural, 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 of quantity, were magnesium oxide (caustic-calcined magnesia, dead burned magnesia, and fused magnesia), magnesium hydroxide, magnesium chloride, and magnesium sulfate.

Salient Statistics—United States:	2019	2020	2021	2022	2023[e]
Production	376	363	432	412	420
Shipments (gross weight)	563	547	634	606	620
Imports for consumption	564	480	655	598	570
Exports	88	66	86	104	100
Consumption, apparent[3]	852	777	1,001	906	880
Employment, plant, number[e]	270	260	270	280	270
Net import reliance[4] as a percentage of apparent consumption	56	53	57	55	52

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

Import Sources (2019–22): Caustic-calcined magnesia: China,[5] 75%; Canada, 20%; Israel, 2%; and other, 3%. Crude magnesite: China,[5] 85%; Singapore, 13%; and other, 2%. Dead-burned and fused magnesia: China,[5] 71%; Brazil, 16%; Turkey, 4%; Mexico, 3%; and other, 6%. Magnesium chloride: Israel, 59%; Netherlands, 24%; China,[5] 5%; and other, 12%. Magnesium hydroxide: Mexico, 57%; Netherlands, 15%; Israel, 12%; Austria, 6%; and other, 10%. Magnesium sulfates: China,[5] 54%; India, 13%; Germany, 11%; Vietnam, 7%; and other, 15%. Total imports: China,[5] 63%; Israel, 9%; Canada, 8%; Brazil, 6%; and other, 14%.

Tariff: Item	Number	Normal Trade Relations 12–31–23
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 2023, consumption of dead-burned and fused magnesia was estimated to have decreased slightly in the United States, and global consumption remained unchanged compared with that in 2022 based on steel production data through August. Domestic consumption for all magnesium compounds has somewhat followed the general trend of the performance of the U.S. manufacturing industry. Globally, China was the leading producer of magnesia and magnesite and remained the principal exporter of magnesia to the United States and much of the world. Prices for Chinese fused magnesia reached a low in May 2023 and remained low as of September. China's domestic fused magnesia market weakened owing to high inventories and low demand. However, China's total fused magnesia exports to India increased by 9% from January through September compared with the same

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period in 2022. This greater demand for refractories used in steelmaking, especially fused magnesia, was attributed to the increase in infrastructure construction in India.

In January 2023, an Austria-based magnesia and refractories company acquired a leading refractory producer in China, allowing it to expand production in China and the east Asia region. In May 2023, North America's largest producer of magnesium chloride acquired full ownership of a fire-retardant company with a supply agreement with the U.S. Forest Service. In June 2023, a Germany-based raw material producer opened a new subsidiary based near Hamburg, Germany, to supply magnesia and chromite to the refractory market. A Greece-based magnesia producer announced that its Turkish subsidiary would construct a new rotary kiln in 2024, doubling its current production capacity of caustic-calcined magnesia to around 50,000 tons per year. In July 2023, another U.S. magnesium chloride producer completed two additional drilling projects at their mine, maximizing brine availability and underground brine residence time thus enhancing their brine grade.

World Magnesite Mine Production and Reserves:[6] In addition to magnesite reserves, vast reserves of magnesium exist in well and lake brines and seawater from which magnesium compounds can be recovered. Reserves for Australia, India, Iran, Saudi Arabia, and Slovakia were revised based on company and Government reports.

	Mine production[e]		Reserves[7]
	2022	2023	
United States	W	W	35,000
Australia	860	860	[8]280,000
Austria	810	810	49,000
Brazil	1,700	1,700	200,000
Canada	150	150	NA
China	13,000	13,000	580,000
Greece	380	380	280,000
India	100	100	66,000
Iran	270	270	10,000
Russia	960	960	2,300,000
Saudi Arabia	340	340	2,800
Slovakia	[9]512	510	1,200,000
Spain	670	670	35,000
Turkey	[9]1,820	1,800	110,000
Other countries	323	320	2,500,000
World total (rounded)	[10]21,900	[10]22,000	7,700,000

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.

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data.

[1]See also the Magnesium Metal chapter.

[2]Reported 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 magnesium oxide (MgO) content was determined to be more useful than reporting in terms of magnesium content. Calculations were made using MgO contents: magnesite, 47.8%; magnesium chloride, 42.3%; magnesium hydroxide, 69.1%; and magnesium sulfate, 33.5%.

[3]Defined as production + imports – exports.

[4]Defined as imports – exports.

[5]Includes Hong Kong.

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

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

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

[9]Reported.

[10]Excludes U.S. production.