MAGNESIUM METAL[1]

(Data in thousand metric tons unless otherwise noted)

Domestic Production and Use: In 2021, primary magnesium was produced by one company in Utah at an electrolytic process smelter that recovered magnesium from brines from the Great Salt Lake. Secondary magnesium was recovered from scrap at smelters that produced magnesium ingot and castings and from aluminum alloy scrap at secondary aluminum smelters. Primary magnesium production in 2021 was estimated to have decreased significantly from that in 2020. Information regarding U.S. primary magnesium production was withheld to avoid disclosing company proprietary data. The leading use for primary magnesium metal, which accounted for 45% of reported consumption, was in castings, principally used for the automotive industry. Aluminum-base alloys that were used for packaging, transportation, and other applications accounted for 35% of primary magnesium metal consumption; desulfurization of iron and steel, 16%; and all other uses, 4%. About 31% of the secondary magnesium was consumed for structural uses, and about 69% was used in aluminum alloys.

Salient Statistics—United States:	**2017**	**2018**	**2019**	**2020**	**2021[e]**
Production:					
Primary	W	W	W	W	W
Secondary (new and old scrap)	112	109	101	100	98
Imports for consumption	42	47	59	61	48
Exports	14	12	10	15	8
Consumption:					
Reported, primary	65	51	52	50	50
Apparent[2]	W	W	W	W	W
Price, annual average:[3]					
U.S. spot Western, dollars per pound	2.15	2.17	2.45	2.49	3.90
European free market, dollars per metric ton	2,265	2,550	2,425	2,149	5,500
Stocks, producer, yearend	W	W	W	W	W
Employment, number[e]	400	400	400	400	400
Net import reliance[4] as a percentage of apparent consumption	<25	<50	<50	<50	<50

Recycling: In 2021, about 29,000 tons of secondary magnesium was recovered from old scrap and 69,000 tons was recovered from new scrap. Aluminum-base alloys accounted for about 57% of the secondary magnesium recovered, and magnesium-based castings, ingot, and other materials accounted for about 43%.

Import Sources (2017–20): Canada, 20%; Israel, 15%; Mexico, 11%; and other, 54%.

Tariff: **Item**	**Number**	**Normal Trade Relations 12–31–21**
Unwrought metal	8104.11.0000	8.0% ad valorem.
Unwrought alloys	8104.19.0000	6.5% ad valorem.
Scrap	8104.20.0000	Free.
Powders and granules	8104.30.0000	4.4% ad valorem.
Wrought metal	8104.90.0000	14.8¢/kg on Mg content + 3.5% ad valorem.

Depletion Allowance: Dolomite, 14% (domestic and foreign); magnesium chloride (from brine wells), 5% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: On September 29, the producer of primary magnesium in Utah declared force majeure, citing equipment failures. Details on the amount of capacity affected and an expected restart date were not reported by the company. A decrease in spot prices in the United States for magnesium imports in the second quarter was attributed to abundant supplies of secondary magnesium favored by secondary aluminum producers. But the average spot price for imported magnesium in the United States increased from $2.06 per pound at the end of June to $2.18 per pound at the end of August, attributed to contracted deliveries being exhausted with strong demand from aluminum smelters and diecasters. The shutdown of capacity in Utah was cited as the reason for the average price of imports into the United States increasing to $5.13 per pound at the end of September and $7.63 per pound at the end of October.

Environmental regulations and power shortages were cited as the reason for raw material shortages, increased power prices, and decreased magnesium production in China, leading to increased magnesium prices in China and Europe. Decreased coal production and increased prices for raw materials such as ferrosilicon starting in April, and strong

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demand for coal by powerplants in the summer months caused prices to continue to rise. Strong demand for magnesium by aluminum smelters and diecasters was also cited for tight supplies, contributing to price increases in the early part of the second quarter of the year. Constrained shipping, high freight rates, and stockpiling by speculators were also cited as reasons for increasing magnesium prices and supply shortages. In August and September, many smelters in China closed capacity to comply with energy consumption targets, leading to further shortages and increased prices. Spot magnesium prices generally trended upward in China and Europe starting in March. The price range in Europe for the first 3 months was $2,600 to $2,700 per metric ton. At the end of June, the price range in Europe increased to between $3,500 and $3,700 per metric ton and, by the end of August, the price ranged between $4,100 and $4,500 per metric ton. At the end of September, the price range in Europe increased to between $10,000 and $11,500 per metric ton and, by mid-October, the price ranged from $12,000 to $15,000 per metric ton. In late October, the price range started to decrease and was $7,700 to $9,500 per metric ton by mid-November.

On March 1, the Government of China removed a 15% tax on magnesium produced in six jurisdictions in the western part of the country. The tax exemption was part of a policy to encourage development of the magnesium industry in the western part of China and increase consumption.

One company obtained a location in Ohio to build a pilot plant to test magnesium production from dolomite. A company in Australia planned to construct a 3,000-ton-per-year smelter to recover magnesium from coal fly ash. A company in Quebec, Canada, planned to construct a primary magnesium smelter to produce magnesium from serpentine-bearing asbestos tailings. The same company in Canada completed construction of an 18,000-ton-per-year secondary magnesium smelter at the same location and started production during the year.

The use of magnesium in automobile parts continued to increase as automobile manufacturers sought to decrease vehicle weight for increased fuel efficiency. Magnesium castings have substituted for aluminum, iron, and steel in some automobiles. The substitution of aluminum for steel in automobile sheet continued to increase consumption of magnesium in aluminum alloy sheet. A shortage of computer chips was cited for some automobile manufacturers decreasing production despite strong demand, resulting in some diecasters decreasing magnesium consumption.

World Primary Production and Reserves:

	Smelter production		Reserves[5]
	2020	2021[e]	
United States	W	W	Magnesium metal can be derived from seawater, natural brines, dolomite, serpentine, and other minerals. The reserves for this metal are sufficient to supply current and future requirements.
Brazil	18	20	
China	886	800	
Israel	19	22	
Kazakhstan	16	20	
Russia	48	60	
Turkey	12	15	
Ukraine	6	10	
World total (rounded)[6]	1,000	950	

World Resources:[5] Resources from which magnesium may be recovered range from large to virtually unlimited and are globally widespread. Resources of dolomite, serpentine, and magnesium-bearing evaporite minerals are enormous. Magnesium-bearing brines are estimated to constitute a resource in the billions of tons, and magnesium could be recovered from seawater along world coastlines.

Substitutes: Aluminum and zinc may substitute for magnesium in castings and wrought products. The relatively light weight of magnesium is an advantage over aluminum and zinc in castings and wrought products in most applications; however, its high cost is a disadvantage relative to these substitutes. For iron and steel desulfurization, calcium carbide may be used instead of magnesium. Magnesium is preferred to calcium carbide for desulfurization of iron and steel because calcium carbide produces acetylene in the presence of water.

[e]Estimated. W Withheld to avoid disclosing company proprietary data.

[1]See also Magnesium Compounds.

[2]Defined as primary production + secondary production from old scrap + imports – exports + adjustments for industry stock changes.

[3]Source: S&P Global Platts Metals Week.

[4]Defined as imports – exports + adjustments for industry stock changes.

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

[6]Excludes U.S. production.