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2018 Minerals Yearbook

MAGNESIUM [ADVANCE RELEASE]

U.S. Department of the Interior
U.S. Geological Survey

October 2021

Magnesium

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During 2018, U.S. primary magnesium reported consumption decreased by 15% and exports decreased by 18% from those in 2017. Total magnesium imports increased by 13% compared with those in 2017 (table 1). Imports continued to provide a significant share of the U.S. supply of primary magnesium because there has been only one domestic producer since 2001. Since 1998, the U.S. share of the world's primary magnesium capacity has decreased to 3% from 30%. During that time period, two of three domestic producers closed, and China had more than a 13-fold increase in capacity and production. Excluding production in the United States, worldwide primary magnesium production was 996,000 metric tons (t) in 2018, 7% less than the revised 1.07 million metric tons (Mt) in 2017 (table 8). Production in China decreased by 8% (70,000 t) and in Turkey by 71% (10,000 t) compared with that in 2017, accounting for most of the decrease in global production. These decreases were partially offset by increased production in Kazakhstan by an estimated 89% (8,000 t) and in Russia by an estimated 8% (5,000 t). China, with 86% of global capacity, accounted for 86% of global production (excluding the United States) (tables 7, 8).

Import prices for magnesium generally increased throughout 2018 in the United States. The U.S. spot dealer import price for magnesium at yearend 2018 was 32% more than that at yearend 2017. The Platts Metals Week annual average U.S. spot Western magnesium price of $2.17 per pound in 2018 was slightly more than the 2017 annual average price. The Platts Metals Week spot magnesium price at yearend in China was $1.22 per pound and in Europe was $1.20 per pound. The prices in China and Europe increased from $1.11 per pound and $1.07 per pound, respectively, at the beginning of the year and then generally increased throughout the year. The prices at yearend 2018 in Europe and China were 12% and 14% higher, respectively, than those at yearend 2017 (table 4).

U.S. reported consumption of primary magnesium decreased by 15% to 45,600 t in 2018 from 53,600 t in 2017. Decreased magnesium consumption for aluminum alloys and for diecastings accounted for most of the decreased consumption. Production of secondary magnesium decreased by 5% in 2018 compared with that in 2017 (tables 1, 2).

Magnesium is the eighth most abundant element in the Earth's crust and the third most plentiful dissolved element in seawater. Magnesium metal is recovered from the mineral dolomite and lake brines. Magnesium's light weight and ease of casting make it desirable for transportation products. Magnesium readily alloys with aluminum to make aluminum products stronger and easier to machine. Magnesium's strong affinity for halides such as chlorine and fluorine make it useful for reducing metal halides such as those of beryllium, hafnium, titanium, uranium, and zirconium to pure metal. Magnesium's chemical properties also make it useful to remove sulfur from iron and steel.

Legislation and Government Programs

Sulfur hexafluoride (SF_6), a cover gas used to protect molten magnesium from oxidation, has been identified as a potential factor in global warming. The molten magnesium processes that use cover gas for melt protection are primary production; secondary production; die, permanent mold, and sand casting; wrought products production; and anode production. According to the U.S. Environmental Protection Agency (EPA), SF_6 emissions by the magnesium industry in 2018 were equivalent to 1.1 teragram of carbon dioxide (CO_2), unchanged from the amount emitted in 2017 and the revised amount emitted in 2016. The industry continued its efforts to use SF_6 alternatives, such as Novec™ 612 (dodecafluoro-2-methyl-3-pentanone), 1,1,1,2 tetrafluoroethane (HFC–134a), and sulfur dioxide, as part of the industry and EPA's partnership, but their use did not increase during 2018 from that in 2017 and 2016. Emissions of HFC–134a in 2018 were equivalent to 0.1 teragram of CO_2, unchanged from the amounts in 2017 and 2016. These alternatives have lower global warming potential than SF_6 and tend to decompose quickly during their exposure to the molten metal. The long atmospheric life (about 3,000 years) of SF_6 and its high potential as a greenhouse gas (23,900 times the global warming potential of CO_2) resulted in a call for voluntary reductions in emissions. In 1999, the U.S. magnesium industry, the International Magnesium Association, and the EPA began a voluntary SF_6 emissions reduction partnership (U.S. Environmental Protection Agency, 2019b, p. 4–86 to 4–90; 2020, p. 4–96 to 4–101).

In 2008, the EPA listed the magnesium production facility at Rowley, UT, owned by US Magnesium LLC (Salt Lake City, UT) as a Superfund site. US Magnesium appealed the decision but, in January 2011, the U.S. Circuit Court of Appeals for the District of Columbia denied the appeal. US Magnesium had argued that the EPA had overestimated the risk of pollutants from the facility entering the air and soil. Designation of the facility as a Superfund site gave the EPA the authority to further investigate the site to determine if a cleanup was necessary. The designated site encompasses 1,830 hectares (4,530 acres) on the southwest edge of the Great Salt Lake. Sampling was completed in September 2015 by the EPA as part of a site study. A report of the results was published in October 2016, but cleanup activities had not started by yearend 2018 (Fahys, 2011; U.S. Environmental Protection Agency, 2019a).

In June, the U.S. Department of Commerce, International Trade Administration (ITA) completed its administrative review on imports of pure magnesium from China for Tianjin Magnesium International Co. Ltd. (TMI) and Tianjin Magnesium Metal Co. Ltd. (TMM) for April 1, 2016, through March 31, 2017. The review determined that TMI and TMM did not export magnesium to the United States during the review period, and the antidumping duty of 339.6% ad valorem would

remain on imports of pure magnesium from TMI and TMM. Magnesium from all other producers in China that did not have an individual rate would have a duty rate of 111.73% ad valorem (U.S. Department of Commerce, International Trade Administration, 2018a, b).

In October, US Magnesium filed a complaint with the U.S. International Trade Commission (USITC) alleging dumping and subsidies of magnesium from Israel by Dead Sea Magnesium Ltd. from January 2015 through October 2018. On December 7, the USITC voted to continue the antidumping and countervailing duty investigations that were initiated on November 15 to determine whether magnesium imported from Israel was sold at less than fair value or unfairly subsidized. Initially, a preliminary countervailing duty determination was expected by January 17, 2019, and the preliminary antidumping determination was expected by April 2, 2019. However, Dead Sea Magnesium was granted extensions, and the determinations were not expected until early May 2019 (Grenham, 2018; McBeth, 2018b, 2019a; U.S. Department of Commerce, 2018).

Production

Because there was only one primary magnesium producer operating in the United States, production data were withheld by the U.S. Geological Survey (USGS) to avoid disclosing company proprietary data. US Magnesium, the sole producer of primary magnesium in the United States, recovered magnesium electrolytically from brines harvested from the Great Salt Lake at its 63,500-metric-ton-per-year (t/yr) plant in Rowley, UT.

Secondary magnesium ingot was produced from scrap by two companies in the United States: Advanced Magnesium Alloys Corp. (Anderson, IN) and MagPro LLC (Camden, TN). Magnesium scrap was also consumed at a foundry by Meridian Magnesium Products Co. in Eaton Falls, MI. Magnesium contained in aluminum alloy scrap was recovered at numerous secondary aluminum smelters. Domestic secondary magnesium metal recovery from magnesium and aluminum scrap decreased by 5% compared with that in 2017. About 69% of the secondary magnesium recovered was contained in aluminum alloys and about 31% was contained in magnesium alloy castings, ingot, and other forms (table 2).

An explosion and fire took place on May 2 at Meridian's diecasting plant in Eaton Falls, MI. The fire reportedly started in the scrap remelting area of the plant. Production at the plant was temporarily shut down until repairs were completed, and the shutdown affected some customers. On May 9, Ford Motor Co. announced that production of trucks and sport utility vehicles would be temporarily shut down at its assembly lines in Dearborn, MI, Kansas City, MO, and Louisville, KY. The vehicle assembly line shutdowns lasted for about a week until equipment from Meridian's diecasting plant was relocated to plants in Canada and the United Kingdom that enabled Ford's parts to be manufactured at those facilities. Several other automobile companies reported that production at some of their automobile assembly lines was disrupted by the incident at the Meridian plant. Repair work started soon after the incident and was completed in about 4 months (Ford Motor Co., 2018a, b; Lacy, 2018; Matyi, 2018a; McBeth, 2018f).

In September, Spartan Light Metal Products Corp. started construction of a new diecasting plant in Mexico, MO, near Spartan's existing diecasting plant. The new project was expected to be completed in about 1 year. Spartan manufactured diecast products from aluminum and magnesium for customers in the automobile industry and other consumer markets. The new capacity would be used mostly to produce magnesium diecastings for electric vehicles. The capacity of the new plant was not available (Spartan Light Metal Products Corp., 2018).

Nevada Clean Magnesium Inc. (Canada) continued testing a process to recover magnesium from dolomite samples from the Tami-Mosi deposit near Ely, NV. The company was searching for a site to construct a 30,000-t/yr magnesium smelter. A construction schedule was not available (Nevada Clean Magnesium Inc., 2018).

Consumption

Data for magnesium metal consumption were collected from two voluntary surveys of U.S. operations by the USGS. Of the 43 companies canvassed for magnesium consumption data, 42% responded, representing about 60% of the magnesium-base scrap consumption reported in table 2 and the primary magnesium consumption reported in table 3. Data for the 25 nonrespondents were estimated on the basis of prior-year consumption levels and other factors.

Primary magnesium consumption in 2018 decreased by 15% compared with that in 2017, which was attributed to decreases in consumption for diecastings and aluminum alloys of 14% and 25%, respectively (table 3). Consumption of secondary magnesium in castings decreased by 9% (3,200 t) compared with that in 2017 (table 2). Decreased consumption for diecastings was attributed to the temporary shutdown of the Eaton Falls, MI, plant and increased imports of cast products to supply automobile makers during the shutdown. Total light-vehicle sales in the United States in 2018 were 17.3 million units, slightly more than the 17.23 million units in 2017 (Lassa, 2019).

The decrease of primary magnesium consumption in aluminum alloys corresponded to increased magnesium content in aluminum scrap used to produce secondary aluminum during the year, even though total aluminum production increased by 5%. The principal applications for magnesium in the United States in 2018 were diecasting (51%); alloying aluminum (25%); and desulfurization of iron and steel (16%) (table 3). Consumption of secondary magnesium scrap for castings in 2018 decreased by 9% to 33,300 t from 36,500 t in 2017 (table 2). Secondary magnesium recovery decreased by 5% compared with that in 2017, attributable to decreased magnesium recovery from magnesium-base new and old scrap, which decreased by 15% and 7%, respectively (table 2).

Research and Development

Research continued at the U.S. Department of Energy's Joint Center for Energy Storage Research to develop a battery that would use a solid magnesium-based electrolyte. A magnesium-scandium-selenide-spinel electrolyte was tested for its ability to move magnesium ions rapidly. The project was part of a program to research battery technology funded by the

U.S. Department of Energy which was renewed in September for 5 years. Magnesium theoretically has twice the energy density of lithium and would be more stable in batteries than lithium. However, without an electrolyte that is compatible with magnesium, magnesium batteries are not practical. Further research would need to be conducted before commercial application of the new technology was feasible (Maloney, 2017; U.S. Department of Energy, 2018).

Prices

The Platts Metals Week U.S. spot Western magnesium price range was $2.10 to $2.20 per pound from the beginning of the year until November when it increased to $2.20 to $2.30 per pound for an annual average price of $2.17 per pound in 2018, slightly higher than the annual average price in 2017. According to traders and producers, however, U.S. spot Western prices were not representative of the prices paid for most magnesium consumed, as nearly all primary magnesium was purchased through annual contracts (Cowden, 2013; McBeth, 2013, 2014). Prices for material contracted in the fall of 2017 for delivery in 2018 ranged from $1.40 to $1.50 per pound (McBeth, 2017). Prices for material contracted in September to early October of 2018 for delivery in 2019 ranged from $1.60 to $1.70 per pound, but after the complaint by US Magnesium was filed against Dead Sea Magnesium with the USITC, contract prices ranged from $1.80 to $2.10 per pound (McBeth, 2018g, 2019c).

Although the U.S. spot Western price range for magnesium was unchanged for most of the year, U.S. spot dealer prices for imported magnesium increased throughout the year from an average range of $1.42 to $1.46 per pound at the beginning of January to $1.85 to $1.95 per pound at the end of December. The annual average spot dealer import magnesium price was $1.57 per pound, 8% higher than that in 2017. Tight supplies in the United States were cited for spot import prices increasing slightly in September. In October, import prices in the United States continued to rise after the antidumping and countervailing duty case was filed by US Magnesium against Dead Sea Magnesium (McBeth, 2018d, g; 2019b).

The average magnesium price in China at the beginning of January was $2,345 per metric ton, and the price generally increased throughout the year, reaching a high of $2,695 per metric ton in November, and was $2,685 per metric ton at the end of December. The annual average magnesium price in China was $2,545 per metric ton, 12% more than that in 2017. The monthly average export price of magnesium from China ranged between $2,440 per metric ton and $2,695 per metric ton. The monthly average export price increased from $2,245 per metric ton in January to $2,525 per metric ton in February but then decreased to $2,440 in March. For the remainder of the year the price generally increased gradually each month until the end of the year. The highest monthly average price was $2,695 per ton in November and $2,685 per ton in December, and averaged $2,545 per ton, 12% more than the average price in 2017. The average magnesium price in Europe at the start of January was $2,350 per metric ton, and the price generally followed the same upward trend as the price in China, peaking at $2,700 per metric ton in September and October, and averaged $2,638 per metric ton at the end of December. The annual average magnesium price in Europe was $2,551 per metric ton, 13% more than that in 2017. Increased cost of production, attributed to higher prices for ferrosilicon, and decreased production, owing to stricter environmental regulations at smelters and coal mines which were used to power smelters in China, were cited for price increases in China and Europe (Lee, 2018a, b; Leung, 2018a, c; McBeth, 2018d; Mok, 2018).

Foreign Trade

Total U.S. magnesium exports in 2018 were 18% less than those in 2017 (table 5). Mexico (40%), Canada (30%), and Brazil (19%) were the principal destinations. In 2018, exports of magnesium alloys, metal, scrap, and semifabricated products decreased by 9%, 23%, 35%, and 49%, respectively, from those in 2017 (table 5). Total magnesium imports for consumption in 2018 were 13% more than those in 2017 (table 6). Israel was the leading source of imported magnesium metal (52%) and alloys (45%). Since 2001, when the United States imposed antidumping duties on magnesium from China, only minor amounts of primary magnesium ingot have been imported from China; however, China was the leading supplier of semifabricated magnesium products (30%) to the United States in 2018. Canada and Mexico supplied 23% and 16%, respectively, of semifabricated magnesium product imports in 2018. Germany was the second-ranked supplier of magnesium alloy imports (24%). Scrap accounted for 47% of total magnesium imports, with Canada (37%), Mexico (22%), and China (10%) as the leading sources of scrap imports (table 6).

World Review

Global production of primary magnesium (excluding the United States) was 996,000 t, 7% less than the revised amount produced in 2017 (table 8). Global consumption of magnesium was estimated to be 975,000 t, a slight increase from that in 2017 (Tauber, 2019, p. 5).

Australia.—Latrobe Magnesium Ltd. was conducting a bankable feasibility study for a 3,000-t/yr primary magnesium plant in the Latrobe Valley, Victoria, which would use fly ash having a high magnesium content as the feed material. Trial work determined that the proposed retort design would not work effectively, and Latrobe changed the plan to use a retort design already in use in the industry. The bankable feasibility study was expected to be completed by June 2019. Construction was expected to begin in December 2019 and take about 1 year to complete once started. Future expansion to 40,000 t/yr was being considered (Latrobe Magnesium Ltd., 2018a, b).

Canada.—On October 22, an explosion and fire took place at Meridian's diecasting plant in Strathmore, Ontario. Two workers were injured, but damage to the plant was minimal. The plant was shut down for less than a week (Matyi, 2018b).

Alliance Magnesium Inc. continued planning construction of the first phase of a smelter in Asbestos, Quebec, to produce magnesium from asbestos mine tailings. Construction was expected to start in 2020 and be completed in about 18 months. The capacity of the first module would be 5,000 t/yr, and expansion to 50,000 t/yr was planned. In 2017, magnesium production started from a 25-kilogram-per-day pilot plant

to produce ingot samples for testing by potential customers (Alliance Magnesium Inc., 2017, 2018; Rastello and Obiko Pearson, 2018).

Mag One Products Inc. continued planning for the construction of a smelter near Danville, Quebec, to produce magnesium from asbestos mine tailings. The plant would have an initial capacity of 5,000 t/yr; total production capacity would be scaled to market demand. The plant would also have the capability to produce high-purity magnesium compounds with ferronickel and high-purity silica as byproducts. A construction schedule was not available (Mag One Products Inc., 2018a, b).

West High Yield Resources Inc. was preparing a mine permit application for its proposed Record Ridge project in British Columbia. The company proposed building a mine and smelter to produce magnesium from a serpentine deposit. A construction schedule was not available. In June 2017, West High Yield presented the results of a micro-plant test prepared by Drinkard Metalox, Inc. (Charlotte, NC). Drinkard Metalox developed a nitric acid leach extraction process that could achieve a magnesium recovery rate of 98% and allow the production of multiple salable products such as magnesium nitrate, high-grade magnesium oxide, and nickel hydroxide (West High Yield Resources Inc., 2013, 2017, 2018).

China.—China produced 860,000 t of magnesium in 2018, 8% less than that in 2017 (table 8). Magnesium consumption in China was estimated to be 450,000 t, 7% more than that in 2017. In 2018, total magnesium product exports from China were 410,000 t, 11% less than those in 2017 (Leung, 2018b; Lee and Leung, 2019).

Stricter environmental regulations for magnesium smelters and associated industries were cited for decreased production throughout the year. In May, regulations in Shaanxi Province were implemented to reduce dust and exhaust emissions, with steep fines for producers that failed to comply unless they shut down. Ningxia Hui Autonomous Region started conducting stricter enforcement of environmental regulations in June. Some coal mines decreased production in the last quarter of the year citing environmental regulations, which increased production costs and decreased output at some magnesium producers. Coal and magnesium producers in Shaanxi Province were particularly affected by these actions. Shaanxi Province was the leading producer of magnesium in China and a major producer of coal, which was used to power the magnesium smelters. Through the end of October, magnesium production decreased in Ningxia Hui Autonomous Region (58%), Shaanxi Province (9%), and Shanxi Province (34%) compared with production for the same period in 2017 (Lee, 2018a, b; Leung, 2018a).

Century Sunshine Group Holdings Ltd. (Hong Kong) continued increasing the capacity of its smelter in Hami, Xinjiang Uyghur Autonomous Region, to 45,000 t/yr from 15,000 t/yr. Dates for the completion and commissioning of the new capacity were not projected and would be dependent on market conditions (Leung, 2018d).

Qinghai Salt Lake Magnesium Co. Ltd. continued the startup of its 100,000-t/yr smelter in Golmud, Qinghai Province, that produced magnesium from lake brines. Construction was completed, and trial runs were conducted in mid-2016. Commercial production started in October 2017, but technical issues interrupted the rampup. By May 2018, the smelter was delivering molten magnesium to Magontec Ltd. (Australia) at its 56,000-t/yr casthouse adjacent to the smelter (Lee, 2017; Magontec Ltd., 2017, 2018; McBeth, 2018a).

Turkey.—In May, Esan Eczacıbaşı Endüstriyel Hammaddeler San. ve Tic. A.Ş shut down production from its 15,000-t/yr smelter in Eskisehir. High production costs and currency valuations were cited as the causes for the shutdown (McBeth, 2018c, d, h).

Outlook

Consumption of magnesium for primary aluminum alloys in the United States is expected to increase owing to the restart of approximately 300,000 t/yr of capacity at three primary aluminum smelters in 2018. Magnesium consumption in the United States by secondary aluminum smelters is expected to remain in the same range as that of recent years. Magnesium consumption by the aluminum industry in other countries is expected to continue to increase as more primary aluminum is produced in countries such as China.

Automobile manufacturers are expected to continue substituting lightweight materials, including magnesium and aluminum, for iron and steel in castings to decrease vehicle weight and meet emission targets. The choice between magnesium and aluminum by casting foundries is expected to be determined in part by the relative prices of the two metals. The use of aluminum sheet alloyed with magnesium in automobiles has increased domestic consumption of magnesium, but further growth in this market is expected to be limited. Because of its higher cost, the use of aluminum sheet alloyed with magnesium in automobiles has been limited to vehicle types with high customer brand loyalty such as light trucks, luxury sedans, and sports cars, but some manufacturers have indicated that they are planning to expand its use to other vehicle types. Although some automobile manufacturers have adopted aluminum sheet alloyed with magnesium, others have signaled that they favor high-strength steel sheet. Some magnesium sheet has been introduced into luxury and high-end sports cars, and although further penetration into these automobile types is being considered, significant use of magnesium in auto sheet applications is not expected for several years (Maltais, 2016).

Increased magnesium consumption by the aerospace industry is expected in the coming years as magnesium may substitute for aluminum in seat frames on commercial aircraft. Although approval was given by the Federal Aviation Administration for use of magnesium in the interior of commercial aircraft in 2013, magnesium-framed seats for commercial aircraft are not expected until at least a few more years. The development of additive manufacturing with magnesium may further increase the use of magnesium in aerospace applications (Magnesium Elektron Ltd., 2014; Danon, 2017). Consumption of magnesium by the iron and steel industry in other countries is expected to increase by 5% in 2019, based on steel production growth (World Steel Association AISBL, 2019).

Although some expansion projects are being constructed in China, additional capacity expansions in China are expected to be limited, as production has been only about one-half of capacity in recent years. The Magnesium Industry Association of Shaanxi

forecast that production in China would increase by 10% per year to 1.3 million metric tons per year by 2020 (Leung, 2015a, b). But stricter enforcement of environmental policies in China was expected to limit production from older smelters that use the Pidgeon process. Global consumption of magnesium is expected to increase by a compound annual growth rate of about 5% per year from 2017 through 2027 (McBeth, 2018e). Consumption growth by the aluminum industry and by diecasters is expected to increase by about 4% per year each during this period (Roskill Information Services Ltd., 2016).

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TABLE 1
SALIENT MAGNESIUM STATISTICS[1]

(Metric tons unless otherwise specified)

		2014	2015	2016	2017	2018
United States:						
Production:						
Primary		W	W	W	W	W
Secondary		81,100	88,500	102,000	114,000	109,000
Exports		17,000	15,200	19,300	13,700	11,100
Imports for consumption		51,900	49,200	45,500	41,900	47,100
Consumption, reported		63,700	63,800	69,000	53,600	45,600
Yearend stocks, producer		W	W	W	W	W
Yearend price[2]	dollars per pound	2.10–2.20	2.10–2.20	2.10–2.20	2.10–2.20	2.20–2.30
World, primary production[3]		995,000	970,000	989,000	1,070,000 r	996,000

rRevised. W Withheld to avoid disclosing company proprietary data.
[1]Table includes data available through May 27, 2020. Data are rounded to no more than three significant digits.
[2]Source: Platts Metals Week.
[3]Does not include U.S. production.

TABLE 2
MAGNESIUM RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES, BY KIND OF SCRAP AND FORM OF RECOVERY[1]

(Metric tons)

	2017	2018
KIND OF SCRAP		
New scrap:		
Magnesium-base	46,700	39,500
Aluminum-base	38,600	40,600
Total	85,400	80,100
Old scrap:		
Magnesium-base	6,810	6,370
Aluminum-base	22,200	22,000
Total	29,000	28,400
Grand total	114,000	109,000
FORM OF RECOVERY		
Magnesium alloy ingot[2]	W	W
Magnesium alloy castings	36,500	33,300
Aluminum alloys	73,500	74,300
Other[3]	4,450	872
Total	114,000	109,000

W Withheld to avoid disclosing company proprietary data; included in "Other."
[1]Table includes data available through May 27, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes secondary magnesium content of both secondary and primary alloy ingot.
[3]Includes chemical and other dissipative uses, cathodic protection, and data indicated by symbol W.

TABLE 3
U.S. CONSUMPTION OF PRIMARY MAGNESIUM, BY USE[1]

(Metric tons)

Use	2017	2018
For structural products:		
Castings:		
Die	26,700	23,100
Permanent mold	302 r	347
Sand	1,370	1,430
Wrought products[2]	W	W
Other	892 r	206
Total	29,300	25,100
For distributive or sacrificial purposes:		
Aluminum alloys	15,300	11,400
Cathodic protection (anodes)	W	W
Iron and steel desulfurization	7,120	7,170
Nodular iron	439	518
Reducing agent for titanium, zirconium, hafnium, uranium, beryllium	300	276
Other[3]	1,150	1,130
Total	24,300	20,500
Grand total	53,600	45,600

[r]Revised. W Withheld to avoid disclosing company proprietary data; included in "Other."
[1]Table includes data available through May 27, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes sheet and plate and forgings.
[3]Includes chemicals and scavenger, deoxidizer, powder, and any data indicated by W.

TABLE 4
YEAREND MAGNESIUM PRICES

		2017	2018
U.S. spot dealer import	dollars per pound	1.42–1.46	1.85–1.95
U.S. spot Western	do.	2.10–2.20	2.20–2.30
China	dollars per metric ton	2,320–2,370	2,670–2,700
European free market	do.	2,300–2,400	2,575–2,700

do. Ditto.

Source: Platts Metals Week.

TABLE 5
U.S. EXPORTS OF MAGNESIUM, BY COUNTRY OR LOCALITY[1]

	Waste and scrap		Metal		Alloys		Powder, sheets, tubing, ribbons, wire, other forms	
Country or locality	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)
2017:								
Brazil	313	$581	--	--	1,650	$4,740	45	$228
Canada	361	750	1,830	$5,590	830	3,070	694	16,900
China	--	--	2	74	8	78	103	3,620
France	--	--	1	400	--	--	43	5,730
Japan	--	--	(2)	18	2	32	29	623
Mexico	9	7	4	41	6,160	19,700	35	2,770
Singapore	--	--	41	11,900	1	3	13	2,140
United Kingdom	226	388	3	15	(2)	12	157	6,310
Venezuela	--	--	--	--	20	106	1	55
Other	287	539	9	508	232	967	544	8,830
Total	1,200	2,270	1,890	18,500	8,900	28,700	1,660	47,200
2018:								
Brazil	148	285	--	--	1,910	5,710	90	301
Canada	85	183	1,400	4,620	1,670	5,550	185	635
China	--	--	2	79	--	--	1	8
France	--	--	8	2,540	--	--	--	--
Japan	--	--	--	--	--	--	8	31
Korea, Republic of	--	--	5	164	87	288	171	567
Mexico	90	140	--	--	4,310	13,900	5	40
Singapore	--	--	44	12,400	--	--	--	--
United Kingdom	117	182	(2)	95	3	9	112	433
Other	343	659	(2)	302	82	584	272	1,010
Total	784	1,450	1,460	20,200	8,060	25,800	844	3,030

-- Zero.
[1]Table includes data available through May 27, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 6
U.S. IMPORTS FOR CONSUMPTION OF MAGNESIUM, BY COUNTRY OR LOCALITY[1]

	Waste and scrap		Metal		Alloys		Powder, sheets, tubing, ribbons, wire, other forms	
Country or locality	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, Mg content)	Value (thousands)	Quantity (metric tons, Mg content)	Value (thousands)
2017:								
Canada	6,050	$13,100	1,210	$1,200	162	$438	823	$4,070
China	327	602	1	7	--	--	1,270	6,480
Germany	864	814	--	--	412	1,570	15	33
Israel	--	--	8,900	33,000	2,210	10,500	15	11
Japan	--	--	--	--	36	122	7	232
Kazakhstan	--	--	55	153	--	--	--	--
Mexico	5,090	7,960	--	--	100	265	584	3,810
Russia	--	--	5,400	14,100	--	--	--	--
Taiwan	521	914	--	--	1,170	3,320	(2)	36
United Kingdom	3,160	8,200	9	23	622	10,900	43	6,560
Other	854	1,380	881	2,860	579	1,620	516	3,410
Total	16,900	32,900	16,500	51,400	5,290	28,800	3,270	24,600
2018:								
Canada	8,210	16,500	1,110	1,580	155	363	784	3,440
China	2,180	4,010	38	48	183	5,740	1,010	8,570
Germany	1,040	955	(2)	3	1,830	5,630	33	128
Israel	--	--	7,240	27,100	3,430	11,800	--	--
Japan	--	--	--	--	--	--	9	104
Kazakhstan	--	--	355	1,040	--	--	--	--
Mexico	4,920	7,470	--	--	1	90	551	2,860
Russia	--	--	3,270	8,930	--	--	--	--
Taiwan	1,430	2,660	--	--	920	2,640	(2)	138
United Kingdom	1,380	3,190	--	--	869	13,300	184	24,800
Other	3,000	5,960	1,960	7,470	263	492	811	4,670
Total	22,200	40,700	14,000	46,200	7,650	40,000	3,380	44,700

-- Zero.
[1]Table includes data available through May 27, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 7
WORLD ANNUAL PRIMARY MAGNESIUM
PRODUCTION CAPACITY, DECEMBER 31, 2018[1]

(Metric tons)

Country or locality[2]	Capacity[e]
Brazil	20,000
China	1,800,000
Iran	6,000
Israel	34,000
Kazakhstan	30,000
Korea, Republic of	10,000
Malaysia	15,000
Russia	81,000
Serbia	5,000
Turkey	15,000
Ukraine	22,000
United States	64,000
Total	2,100,000

[e]Estimated.
[1]Includes capacity at operating plants as well as at plants on standby basis. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]In addition to the countries and (or) localities listed, trial production from a pilot plant in Canada was reported starting in 2017. Magnesium was produced to determine the economic viability of an experimental process and to provide samples for certification by potential consumers, but available information was inadequate to make a reliable estimate of output.

TABLE 8
MAGNESIUM: PRIMARY WORLD PRODUCTION, BY COUNTRY OR LOCALITY[1]

(Metric tons)

Country or locality[2]	2014	2015	2016	2017	2018
Brazil[e]	16,000	15,000	15,000	15,000	15,000
China	874,000	859,000	871,000	930,000 [e]	860,000 [e]
Iran[e]	500	1,000	2,000	3,000	1,000
Israel	25,993	19,307	22,548	23,000	21,000
Kazakhstan[3]	9,500	8,100	10,000 [e]	9,000 [e]	17,000 [e]
Russia[3]	62,000 [e]	60,000 [e]	58,000	65,000 [r]	70,000 [e]
Turkey	--	200	3,750 [e]	14,000 [e]	4,000 [e]
Ukraine[e, 3]	7,200	7,700	6,770	8,000	8,000
United States	W	W	W	W	W
Total	995,000	970,000	989,000	1,070,000 [r]	996,000

[e]Estimated. [r]Revised. W Withheld to avoid disclosing proprietary data, not included in total. -- Zero.
[1]Table includes data available through June 24, 2019. All data are reported unless otherwise noted. Totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.
[2]In addition to the countries and (or) localities listed, trial production from a pilot plant in Canada was reported starting in 2017. Magnesium was produced to determine the economic viability of an experimental process and to provide samples for certification by potential consumers, but available information was inadequate to make a reliable estimate of output.
[3]Includes magnesium consumed for titanium sponge production.