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2015 Minerals Yearbook

MAGNESIUM [ADVANCE RELEASE]

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Magnesium

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During 2015, total magnesium imports and consumption decreased slightly. Net imports of magnesium increased slightly. Imports continued to provide a significant share of U.S. supply of primary magnesium as 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 twelvefold increase in production. Excluding production in the United States, worldwide primary magnesium production was 972,000 metric tons (t) in 2015, 3% less than the revised 1 million metric tons (Mt) in 2014 (table 8). Production in China declined by 3% (22,000 t) and in Israel by 26% (6,700 t), accounting for most of the decline in production. China, with 84% of global capacity, accounted for 88% of global production (excluding the United States) (tables 7, 8).

Import prices for magnesium generally decreased throughout 2015 in the United States and Europe, and prices in China also generally decreased as consumption declined slightly in the United States and was stagnant in Europe, and production in China exceeded domestic consumption. The U.S. spot dealer import price for magnesium at yearend 2015 was 9% less than that at yearend 2014. The prices at yearend 2015 in China and Europe were 22% and 20% less, respectively, than those at yearend 2014. However, the Platts Metals Week annual average magnesium price of $2.15 per pound in 2015 was unchanged from the 2014 annual average price.

U.S. consumption of primary magnesium decreased slightly to 65,200 t in 2015 from 65,900 t in 2014. Decreased magnesium consumption for aluminum alloys, castings, the iron and steel industry, and wrought products was partially offset by increased consumption for reducing titanium and other metals. Production of secondary magnesium was essentially unchanged in 2015 compared with that in 2014 (table 1). Consumer inventories of primary magnesium and alloys at yearend 2015 increased slightly from those at yearend 2014 and consumer inventories of secondary magnesium and alloys increased by 41%.

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 minerals carnallite and 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.

[1]Deceased.

Legislation and Government Programs

The cover gas sulfur hexafluoride (SF_6), which is used to protect molten magnesium from oxidation, has been identified as a potential factor in global warming. The molten magnesium processes that use SF_6 for melt protection are primary production; secondary production; die, permanent mold, and sand casting; wrought products production; and anode production. 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 carbon dioxide (CO_2)] resulted in a call for voluntary reductions in emissions. In 1999, the U.S. magnesium industry, the International Magnesium Association, and the U.S. Environmental Protection Agency (EPA) began a voluntary SF_6 emissions reduction partnership. According to the EPA, the magnesium industry emitted 1.0 teragrams CO_2 equivalent of SF_6 in 2014, a decrease of approximately 33% from 2013 emissions. Decreased production of magnesium and magnesium products was cited as the principal reason for the decreased emissions. The decrease was also partly attributed to continuing industry efforts to use SF_6 alternatives, such as Novec™ 612 (dodecafluoro-2-methyl-3-pentanone) and sulfur dioxide, as part of the industry and EPA's partnership. These alternatives have lower global warming potential than SF_6 and tend to decompose quickly during their exposure to the molten metal (U.S. Environmental Protection Agency, 2016b, p. 4–75 to 4–79).

In January 2011, the U.S. Circuit Court of Appeals for the District of Columbia denied U.S. Magnesium LLC's (Salt Lake City, UT) appeal of the EPA's decision to include the company's Rowley, UT, magnesium production facility as a Superfund site. U.S. Magnesium had challenged the EPA's 2008 listing decision and 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 conducted in 2015 by the EPA and contractors as part of a study of the site, but cleanup activities had not started by yearend (Fahys, 2011; U.S. Environmental Protection Agency, 2016a).

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. U.S. Magnesium was the sole producer of primary magnesium in the United States. The company 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. U.S. Magnesium was

expanding capacity of the plant to 76,500 t/yr and revised the completion date to yearend 2016 from yearend 2015 (McBeth, 2016a). Domestic secondary metal recovery from magnesium and aluminum scrap was essentially unchanged from that in 2014. About 84% of the secondary magnesium recovered was contained in aluminum alloys and 16% was contained in magnesium alloy castings, ingot, and other forms (table 2).

Nevada Clean Magnesium Inc. (Canada) expected to complete a bench-scale pilot plant to test recovery of magnesium from dolomite in early 2016. The company planned to produce 30,000 t/yr of magnesium from its Tami-Mosi deposit near Ely, NV, that graded an average of 12.3% magnesium (Nevada Clean Magnesium Inc., 2015).

Consumption

Data for magnesium metal consumption were collected from two voluntary surveys of U.S. operations by the USGS. Of the 54 companies canvassed for magnesium consumption data, 43% responded, representing 55% of the magnesium-base scrap consumption listed in table 2 and the primary magnesium consumption listed in table 3. Data for the 31 nonrespondents were estimated on the basis of prior-year consumption levels and other factors.

Primary magnesium consumption in 2015 decreased slightly compared with that in 2014, which was attributed to decreases of 5% and 8%, respectively, in consumption for aluminum alloys and die castings, partially offset by a 12% increase in consumption for titanium reduction (table 3). The decrease of primary magnesium consumption in aluminum alloys corresponded to primary and secondary aluminum production decreases of 7% and 6%, respectively. Consumption in die casting decreased as several diecasters decreased consumption of magnesium in favor of aluminum (McBeth, 2015). The principal applications for magnesium in the United States in 2015 were reduction of titanium tetrachloride, zirconium chloride, beryllium fluoride, uranium tetrafluoride, and hafnium chloride to produce metals (34%); alloying aluminum (33%); diecasting (12%); and desulfurization of iron and steel (11%). Consumption of secondary magnesium scrap for castings in 2015 increased by 5% to 11,100 t from 10,500 t in 2014 (table 2). Secondary magnesium recovery was essentially unchanged compared with that in 2014 as increased magnesium recovery from magnesium-base scrap offset decreased recovery from aluminum-base scrap (table 2).

Allegheny Technologies Inc. (ATI) (Pittsburgh, PA) increased titanium sponge production at its plant in Rowley. ATI consumed 1 t of molten magnesium from U.S. Magnesium's plant for each metric ton of titanium sponge produced. ATI started production at the Rowley plant in 2009 but had not yet ramped up to its full capacity of 10,900 t/yr. ATI planned to ramp up production to about 90% of capacity by yearend and ramp up to full capacity in 2016, if market conditions warrant. The titanium sponge would be used in aerospace and medical applications (Haflich, 2015).

Research and Development

At yearend, the U.S. Department of Energy's Advanced Research Projects Agency-Energy canceled a research project on a method of recovering magnesium from seawater that was being conducted at the Pacific Northwest National Laboratory (PNNL) in Richland, WA. Announced in 2013, the research was on a low-temperature, low-energy dehydration process for magnesium chloride brine with a catalyst-assisted process to produce an organometallic reactant from magnesium chloride, which then would be decomposed to produce magnesium metal. Although the project succeeded in demonstrating each step in the process, it was canceled when it was determined that commercialization was not likely in the foreseeable future. Global Seawater Extraction Technologies, LLC and U.S. Magnesium partnered with PNNL in the $2.43 million project (U.S. Department of Energy, 2015; B.P. McGrail, Laboratory Fellow, Pacific Northwest National Laboratory, U.S. Department of Energy, written commun., September 15, 2016).

Prices

The Platts Metals Week U.S. spot Western magnesium price range was $2.10 to $2.20 per pound throughout the year and the annual average Platts Metals Week U.S. spot Western magnesium price in 2015 was $2.15 per pound, unchanged from the average price in 2014. 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, 2014a). Prices for material contracted in the fall of 2014 for delivery in 2015 ranged from about $1.80 per pound to $1.92 per pound, with most contracts reported to be in the range of $1.82 per pound to $1.88 per pound (McBeth, 2014b). Prices for material contracted in the fall of 2015 for delivery in 2016 ranged from $1.67 per pound to $1.80 per pound (McBeth, 2015). The Platts Metals Week U.S. spot dealer import price range was $1.81 to $1.85 per pound in January and generally declined throughout the year to $1.68 to $1.72 per pound in December. The annual average spot dealer import magnesium price was $1.78 per pound, which was 6% lower than in 2014.

The January average magnesium price in China was $2,280 per metric ton and the price generally declined throughout the year to $1,825 per metric ton in December. The annual average magnesium price in China was $2,116 per metric ton, 14% lower than in 2014. The January average magnesium price in Europe was $2,375 per metric ton and the price generally followed the same downward trend as the price in China, averaging $1,950 per metric ton in December. The annual average magnesium price in Europe was $2,170 per metric ton, 17% lower than in 2014. Abundant supplies of magnesium relative to consumption in China, stagnant demand in Europe and slightly lower consumption in the United States were cited for the price declines (Leung, 2015e).

Foreign Trade

Total U.S. magnesium exports in 2015 were 11% less than those in 2014 (table 5). Canada (42%), Mexico (25%), and Singapore (17%) were the principal destinations. Exports of magnesium metal, alloys, and waste and scrap in 2015 were 13%, 8%, and 53% lower, respectively, than those in 2014. Exports of semifabricated products increased by 8% compared with those in 2014. Magnesium imports for consumption in 2015 were slightly less than those in 2014 (table 6). Israel was the leading source of imported magnesium metal (70%) and alloys (26%). 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 second leading supplier of the magnesium alloys and the leading supplier of semifabricated magnesium product imports to the United States. China supplied 23% of magnesium alloys and Taiwan was the third leading supplier of magnesium alloy imports (21%). Canada accounted for 47% of the scrap imports, which accounted for 19% of total magnesium imports (table 6). China supplied 66% of the imports of semifabricated magnesium products. Total net imports (imports minus exports) of magnesium were slightly more than those in 2014; net imports of metal and semifabricated products decreased by 14% and 27%, respectively, but net imports of alloys and scrap increased by 39% and 15%, respectively (tables 5, 6).

In July, the U.S. Department of Commerce ruled that certain magnesium alloys jointly patented and developed by Dead Sea Magnesium Co. Ltd. (DSM) (Israel) and Volkswagen AG (Germany) were within the scope of the antidumping duty order on pure magnesium from China. DSM had planned to export magnesium alloy from China to the United States and requested a scope ruling to determine if the patented alloys would be subject to the 111.73% antidumping tariff rate. DSM said it would continue to supply the alloys to the United States from its plant in Israel instead of China (Platts Metals Daily, 2015).

World Review

Global production of primary magnesium (excluding the United States) was 972,000 t, 3% less than was produced in 2014 (table 8). Global primary capacity increased slightly to 1.9 million metric tons per year (Mt/yr) (table 7).

Australia.—Latrobe Magnesium Ltd. continued planning for a 5,000-t/yr primary magnesium plant in the Latrobe Valley, Victoria, which would use fly ash having a high magnesium content as the feed material. Construction was scheduled to start in July 2016 and was expected to take about 1 year to complete. Future expansion to 40,000 t/yr was being considered (Latrobe Magnesium Ltd., 2015).

Canada.—Three companies proposed magnesium projects in Canada. In May, Alliance Magnesium Inc. started a 200-t/yr pilot plant to test recovery of magnesium from asbestos mine tailings in Asbestos, Quebec. If the process proves to be commercially viable, Alliance plans to construct a 50,000-t/yr smelter by 2018 (Alliance Magnesium Corp., 2015).

Mag One Products Inc. received a grant from the Canadian Government's Industrial Research Assistance Program to help it develop technology to produce magnesium from asbestos mine tailings. Mag One planned to build a smelter to produce magnesium from asbestos mine tailings near Danville, Quebec (Mag One Products Inc., 2015).

West High Yield Resources Inc. received a permit to extract a 10,000-t bulk sample from a serpentine deposit at its Record Ridge project in British Columbia to test for recovery of magnesium. The company proposed building a mine and smelter to produce magnesium. According to a preliminary economic assessment, measured and indicated resources totaled 10.6 Mt of serpentine grading 24.6% magnesium (West High Yield Resources Inc., 2014, 2015).

China.—According to the China Non-Ferrous Metals Industry Association, China produced 852,000 t of magnesium in 2015, a decrease of 3% compared with that in 2014. Decreased production was attributed to decreased consumption by consumers in China and in its export market. Despite decreased demand and lower prices throughout the year, some producers continued production in anticipation of increased demand at yearend and in early 2016. Although stocks of metal at smelters reportedly doubled from the end of September through the end of October and then increased by 37% during November from those at the end of October, many smelters reportedly liquidated stocks in December to obtain cash to repay loans due at yearend. In April, despite weak demand, producers in Shaanxi Province unsuccessfully tried to set a floor price for domestic sales of magnesium at about $2,100 per metric ton. The price continued to decline, however, and in November, the producers tried to establish a new price floor at $1,932 per metric ton, but domestic prices declined further as stocks were liquidated at yearend (Leung, 2015f–i; Lee, 2016).

In 2015, China exported 206,000 t of unwrought magnesium, 9.3% less than in 2014, but exports of magnesium alloys increased by 7.7% to 115,000 t. Exports of magnesium powders and granules decreased by 11.7% to 77,700 t, and exports of magnesium products decreased by 11.9% to 5,000 t. In August, an explosion at the Tianjin port disrupted exports and in December, magnesium exports were temporarily halted from the port as stricter inspections of cargos were carried out (Leung, 2015c, 2016; Yee, 2016a–c).

Century Sunshine Group Holdings Ltd. (Hong Kong) expected to complete expansion of its smelter in Baishan, Jilin Province, to 75,000 t/yr by yearend 2016. In 2014, Century Sunshine expanded capacity to 25,000 t/yr from 16,000 t/yr (Leung, 2015a).

Qinghai Salt Lake Magnesium Industry Co. Ltd. continued to construct a 100,000-t/yr smelter to produce magnesium from lake brines in Golmud, Qinghai Province. Completion, which had been expected in early 2016, was delayed to mid-2016 for undisclosed reasons. Expansion to 400,000 t/yr was planned, but a construction schedule was not announced. Magontec Ltd. (Australia) continued to construct a 56,000-t/yr casthouse in Golmud to be supplied with molten magnesium from the Qinghai Salt Lake smelter (Leung, 2015j; Magontec Ltd., 2016, p. 5, 14).

Israel.—Magnesium production decreased by 26% compared with that in 2014 to 19,300 t, principally owing to a strike at DSM [a subsidiary of Israel Chemicals Ltd. (ICL)], Israel's

only magnesium producer, that reduced production from mid-February through May. The strike began at ICL's subsidiary, Dead Sea Bromine Co. Ltd., and was joined by its facility that produced chlorine, a byproduct of magnesium metal production. DSM reported that it was able to fill its contracted orders and only capacity used to fill spot orders was affected. On November 30, Israel passed a law increasing taxes on natural resource production. The tax on magnesium production would take effect on January 1, 2017. The new tax rate was 25% to 42% on excess profits and a 5% royalty on the value of magnesium produced (Barry, 2015; Sandler, 2015; Israel Chemicals Ltd., 2016a, p. 225–227; 2016b, p. 75).

Turkey.—In September, Esan Eczacibasi completed construction of a 15,000-t/yr magnesium Pidgeon process smelter in Eskisehir and was evaluating expansion of the smelter to 30,000 t/yr. Rampup to 15,000 t/yr was expected to be completed by yearend 2016 (McBeth, 2016b).

Outlook

Consumption of magnesium for primary aluminum alloys in the U.S. is expected to decrease in coming years from prior levels because of the shutdown of several primary aluminum smelters at the end of 2015 and early 2016. Increased magnesium consumption in the United States by secondary aluminum smelters is expected to offset some of the lost consumption by primary aluminum smelters in coming years. However, 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.

In order to decrease vehicle weight and meet emission targets, automobile manufacturers are expected to use less iron and steel for castings, a trend that could increase global consumption of magnesium. Because of low aluminum prices, some foundries were switching to aluminum instead of magnesium, a trend which could continue if aluminum prices remain low. The use of aluminum sheet alloyed with magnesium in automobiles is expected to increase consumption of magnesium. Because of its higher cost, the use of aluminum sheet in automobiles may be limited to vehicle types with high customer brand loyalty such as light trucks, luxury sedans, and sports cars. Although some automobile manufactures have adopted aluminum sheet, others have signaled that they favor high-strength steel sheet. Some magnesium sheet has been introduced into luxury and high-end sports cars, and further penetration into these automobile types is expected.

Possible new magnesium production in Australia, Canada, and the United States may encourage automotive manufacturers to use magnesium instead of other lightweight alternatives to steel. Historically, because of the limited number of magnesium producers outside of China, domestic automotive manufacturers were somewhat reluctant to choose magnesium over other lightweight materials, such as aluminum alloys or plastic. Because Chinese producers account for 84% of global primary magnesium capacity, and antidumping duties assessed on magnesium deter imports from China, some automotive manufacturers continue to be cautious about switching to magnesium, thereby limiting the growth of magnesium consumption. Some auto parts manufacturers have expressed willingness to produce cast parts in Europe and other locations that do not have antidumping tariffs on magnesium from China. Therefore, magnesium consumption by the automobile industry may increase faster outside of the United States. Consumption of magnesium by the iron and steel industry in other countries is expected to increase slightly (World Steel Association, 2016).

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 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 Mt/yr by 2020 (Leung, 2015b, d).

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TABLE 1
SALIENT MAGNESIUM STATISTICS[1]

(Metric tons unless otherwise specified)

		2011	2012	2013	2014	2015
United States:						
Production:						
Primary		W	W	W	W	W
Secondary		67,100 r	77,100	79,300 r	80,200 r	80,000
Exports		12,300	18,300	16,100	17,000	15,200
Imports for consumption		48,400	50,800	45,900	54,700 r	53,600
Consumption, primary		80,600	71,900	68,500	65,900 r	65,200
Yearend stocks, producer		W	W	W	W	W
Yearend price[2]	dollars per pound	2.05–2.20	2.15–2.25	2.10–2.15	2.10–2.20	2.10–2.20
World, primary production[e]		806,000 r	840,000 r	909,000 r	1,000,000 r	972,000

[e]Estimated. [r]Revised. W Withheld to avoid disclosing company proprietary data.
[1]Data are rounded to no more than three significant digits.
[2]Source: Platts Metals Week.

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

(Metric tons)

	2014	2015
KIND OF SCRAP		
New:		
Magnesium-base	17,200	20,200
Aluminum-base	38,000 r	37,100
Total	55,200 r	57,400
Old:		
Magnesium-base	653	606
Aluminum-base	24,300 r	22,100
Total	25,000 r	22,700
Grand total	80,200 r	80,000
FORM OF RECOVERY		
Magnesium alloy ingot[2]	W	W
Magnesium alloy castings	10,500	11,100
Aluminum alloys	68,900 r	67,300
Other[3]	722 r	1,710
Total	80,200 r	80,000

[r]Revised. W Withheld to avoid disclosing company proprietary data; included in "Other."
[1]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	2014	2015
For structural products:		
Castings:		
Die	8,700	8,020
Permanent mold	278	291
Sand	660	635
Wrought products[2]	2,340	1,920
Total	12,000	10,900
For distributive or sacrificial purposes:		
Aluminum alloys	22,600	21,500
Cathodic protection (anodes)	1,010	1,030
Iron and steel desulfurization	7,800	7,300
Nodular iron	627	491
Reducing agent for titanium, zirconium, hafnium, uranium, beryllium	19,900	22,300
Other[3]	2,070	1,800
Total	53,900	54,300
Grand total	65,900	65,200

[1]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, and powder.

TABLE 4
YEAREND MAGNESIUM PRICES

		2014	2015
U.S. spot dealer import	dollars per pound	1.83–1.89	1.68–1.72
U.S. spot Western	do.	2.10–2.20	2.10–2.20
China	dollars per metric ton	2,300–2,350	1,800–1,850
European free market	do.	2,375–2,475	1,900–2,000

do. Ditto.

Source: Platts Metals Week.

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

	Waste and scrap		Metal		Alloys		Powder, sheets, tubing, ribbons, wire, other forms	
Country	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
2014:								
Brazil	--	--	1,080	$3,960	1,450	$5,490	15	$180
Canada	435	$1,340	1,980	6,860	821	3,000	344	9,750
China	1	3	--	--	19	218	199	5,280
France	--	--	--	--	--	--	92	10,500
Mexico	382	950	59	162	5,710	22,600	185	5,910
Singapore	--	--	2,600	10,300	--	--	22	2,720
United Kingdom	11	11	22	44	39	174	326	12,000
Other	93 r	152 r	285	629	113 r	628 r	725 r	11,500
Total	922 r	2,460	6,020 r	22,000 r	8,150 r	32,100 r	1,910 r	57,900 r
2015:								
Brazil	--	--	--	--	482	1,830	67	225
Canada	144	338	2,410	7,310	3,420	11,200	443	20,800
China	--	--	--	--	34	243	145	4,120
France	--	--	--	--	--	--	64	9,680
Mexico	234	469	12	32	3,420	12,900	122	5,800
Singapore	3	8	2,500	10,300	1	5	16	3,630
United Kingdom	--	--	24	48	(2)	8	128	8,140
Venezuela	--	--	--	--	1	20	94	8,810
Other	52	80	277	608	130	1,010	977	10,500
Total	433	895	5,220	18,300	7,490	27,200	2,060	71,700

rRevised. -- Zero.
[1]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[1]

	Waste and scrap		Metal		Alloys, magnesium content		Powder, sheets, tubing, ribbons, wire, other forms, magnesium content	
Country	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
2014:								
Canada	7,670	$18,200	1,200	$1,490	295	$995	1,050	$4,530
China	97	238	10	29	778	2,720	6,170	16,700
Germany	109	241	95	451	673	2,320	89	362
Israel	--	--	11,700	49,800	4,170	18,400	--	--
Japan	--	--	(2)	7	313	1,030	8	67
Kazakhstan	--	--	156	563	--	--	--	--
Mexico	3,560	6,960	20	50	43	127	621	4,100
Russia	--	--	2,350	7,760	--	--	45	258
Taiwan	464	1,250	--	--	2,950	8,890	(2)	258
United Kingdom	1,350	4,170	(2)	23	1,190	16,700	36	1,950
Other[r]	5,760	12,800	911	4,950	511	1,840	319	2,530
Total	19,000	43,800	16,400 [r]	65,200 [r]	10,900 [r]	53,000 [r]	8,330 [r]	30,700 [r]
2015:								
Canada	9,960	19,800	1,130	1,280	476	1,290	1,190	4,980
China	228	520	(2)	2	2,560	8,760	4,460	11,500
Germany	602	1,530	--	--	563	1,930	57	180
Israel	--	--	9,910	42,200	2,980	13,700	7	599
Japan	(2)	5	(2)	5	939	3,050	12	354
Kazakhstan	--	--	226	850	--	--	--	--
Mexico	3,550	6,740	(2)	6	53	139	610	4,300
Russia	--	--	1,870	6,030	40	132	69	442
Taiwan	462	1,030	--	--	2,380	6,720	(2)	37
United Kingdom	4,570	11,200	(2)	32	816	14,900	22	2,340
Other	1,930	3,640	1,070	5,350	534	1,950	315	3,430
Total	21,300	44,400	14,200	55,700	11,300	52,600	6,740	28,200

[r]Revised. -- Zero.
[1]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, 2015[1]

(Metric tons)

Country	Capacity
Brazil	22,000
China	1,600,000
India	900
Israel	34,000
Kazakhstan	30,000
Korea, Republic of	10,000
Malaysia	15,000
Russia	80,000
Serbia	6,000
Turkey	15,000
Ukraine	22,000
United States	63,500
Total	1,900,000

[1]Includes capacity at operating plants as well as at plants on standby basis.

TABLE 8
MAGNESIUM: ESTIMATED PRIMARY WORLD PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country	2011	2012	2013	2014	2015
Brazil	16,000	16,000	16,000	16,000	15,000
China	675,000	698,000	770,000	874,000	852,000 [3]
Israel[3]	26,300	27,300	27,400	26,000	19,300
Kazakhstan[4]	21,400 [r]	21,200 [r]	13,000 [r]	9,500 [r]	8,100
Korea, Republic of	--	2,500	7,500	10,000	10,000
Malaysia	200 [3]	-- [3]	150	--	--
Russia[4]	58,000 [r]	65,000 [r]	66,000 [r]	62,000 [r]	60,000
Serbia	-- [r]	-- [r]	-- [r]	-- [r]	--
Turkey	--	--	--	--	200
Ukraine[4]	9,000 [r]	10,300 [r]	9,400 [r]	7,200 [r]	7,700
United States	W	W	W	W	W
Total	806,000 [r]	840,000 [r]	909,000 [r]	1,000,000 [r]	972,000

[r]Revised. W Withheld to avoid disclosing company proprietary data; not included in "Total." -- Zero.
[1]Totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes data available through October 4, 2016.
[3]Reported figure.
[4]Includes magnesium consumed for titanium sponge production.