



# 2017 Minerals Yearbook

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## ABRASIVES, MANUFACTURED [ADVANCE RELEASE]

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# ABRASIVES, MANUFACTURED

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In 2017, U.S. production of metallic abrasives was 179,000 metric tons (t), with a value of \$121 million, and apparent consumption of all forms of metallic abrasives was 178,000 t. U.S. shipments of metallic abrasives were 197,000 t valued at \$148 million (table 4). Estimated production of fused aluminum oxide in the United States and Canada, combined and rounded to the nearest 5,000 t, was 10,000 t, with an estimated value of \$1.7 million (table 2). Apparent consumption of fused aluminum oxide in the United States was estimated to be 200,000 t. U.S. silicon carbide production was estimated to be 35,000 t, also rounded to the nearest 5,000 t, with an estimated value of \$25.9 million (table 2). Apparent consumption of crude silicon carbide was estimated to be 171,000 t.

Abrasives are natural or manufactured substances that are used to abrade, clean, etch, grind, polish, scour, or otherwise remove solid material by rubbing action (as in a grinding wheel) or impact (as in pressure blasting). The most important physical properties for abrasives are character of fracture (cleavage), friability (tendency to break into smaller particles), grain shape and size, hardness (scratch hardness), purity (uniformity), and toughness (rigidity). Additional properties considered for application include availability, bonding characteristics, cost, and thermal stability. Manufactured abrasives are made from metals or minerals by heating or chemically treating them to enhance or give them abrasive properties. Abrasives play an important role in the fashioning and finishing of many products with a wide range of applications.

Manufactured abrasives generally dominate high-grade abrasives markets as opposed to natural abrasives because they have superior physical properties, more uniform quality, and can be tailored to meet users' needs. Consequently, manufactured abrasives typically are characterized by premium prices relative to natural abrasive minerals. Even though manufactured abrasives are usually more expensive, their durability and efficiency have proven to be more cost effective, and they are preferred in many industrial applications, such as metal finishing, cutting, and polishing. In the United States, large quantities of manufactured abrasives also are used in cutting and finishing wallboard and timber. The abrasives market is mature, and the use of various manufactured abrasive materials is well defined by application.

This chapter includes information on the following abrasives manufactured in the United States: aluminum-zirconium oxide, boron carbide, fused aluminum oxide, metallic shot and grit, and silicon carbide. In some cases, United States production data were combined with output from Canada to avoid disclosing company proprietary data and still provide useful information on the overall Canada–United States market. Trade data in this chapter are from the U.S. Census Bureau. All percentages in the chapter were calculated using unrounded data.

## Metallic Abrasives

**Production.**—In 2017, 11 companies operating 12 plants within the United States produced metallic abrasives (table 3). Data on U.S. production and shipments of metallic abrasives were based on a survey of domestic producers conducted by the U.S. Geological Survey (USGS) and were estimated for nonreporting producers on the basis of previously reported data and industry trends.

Five companies reported production of steel shot and grit in 2017, which accounted for most of the metallic abrasives produced domestically (table 4). U.S. production of steel shot and grit in 2017 decreased by 5% to 177,000 t compared with that of 2016. Estimated production of cut wire shot by U.S. producers increased by 5% to 1,980 t from 1,890 t in 2016 (table 4). Six companies reported production of cut wire shot in 2017, most of which was cut from carbon steel wire and stainless steel wire. Other products reported included shot cut from aluminum, copper, and zinc wire. One company reported production of steel nuggets, a wrought carbon steel blast medium with properties like those of steel shot.

**Consumption.**—Metallic abrasives were used primarily as loose particles propelled at high velocities for blast cleaning or to improve the properties of metal surfaces. Principal consumers included foundries, machine tool industries, metalworking plants (particularly those supporting the automotive and aircraft industries), and steel manufacturers.

During 2017, shipments of steel shot and grit by U.S. producers decreased by 4% to 194,000 t compared with those in 2016 (table 4). Domestic shipments of cut wire shot increased by 17% to an estimated 2,140 t compared with the quantity of 1,820 t in 2016. The total quantity of all forms of metallic abrasives consumed in the United States in 2017 was about 178,000 t, compared with 214,000 t in 2016. Apparent consumption for metallic abrasives was calculated as production plus imports minus exports.

**Prices.**—The USGS compiles survey data on the value of production and shipments but does not collect price data. The average unit value for U.S. production of steel shot and grit in 2017 was \$639 per ton, and the average unit value for sales of all steel shot and grit by U.S. producers was \$719 per ton (table 4). The estimated average unit value for U.S. production of cut wire shot in 2017 was \$3,770 per ton, and the estimated average unit value for sales of cut wire shot by U.S. producers was \$4,100 per ton. The average free alongside ship (f.a.s.) unit value for metallic abrasives exported from the United States during 2017 was \$1,640 per ton, and the average customs unit value of imports was \$1,020 per ton (tables 5, 6).

**Foreign Trade.**—During 2017, the United States exported metallic abrasives to 49 countries and imported metallic abrasives from 21 countries. U.S. exports of metallic abrasives increased by 8% during the year to 31,000 t valued at \$50.7 million (table 5). Mexico (60%), Canada (18%), and China (14%) were the leading recipients of United States exports of metallic abrasives in 2017. U.S. imports totaled 29,700 t valued at \$30.2 million (table 6). Most of the imports came from Canada (36%), China (19%), Germany (16%), and Japan and Thailand (7% each).

### Fused Aluminum Oxide and Aluminum-Zirconium Oxide

**Production.**—Production data for crude and high-purity fused aluminum oxide in this chapter were obtained by the USGS from producers in Canada and the United States. The data were collected from two companies that operated four plants and represented the entire Canada and United States fused aluminum oxide industry (table 1). Saint-Gobain Abrasives operated a fused aluminum oxide plant in the United States (Huntsville, AL), and Saint-Gobain Ceramic Materials Canada Inc. operated an aluminum-zirconium oxide plant in Canada (Chippewa, Ontario). Washington Mills Electro Minerals Corp. operated fused aluminum oxide plants in Canada (Niagara Falls, Ontario) and the United States (Niagara Falls, NY). Quantity data from the two countries were combined to avoid disclosing company proprietary data and were reported by the producers, estimated for nonreporting producers, and rounded to the nearest 5,000 t. Estimates were based on previously reported data and industry trends.

Estimated production of crude fused aluminum oxide in 2017 was rounded to 10,000 t, with an estimated value rounded to \$1.7 million (table 2). The quantity and value were essentially unchanged compared with 2016. High-purity fused aluminum oxide output was not reported to avoid disclosing company proprietary data.

During 2017, aluminum-zirconium oxide for abrasive applications, such as resin-bonded grinding wheels, was produced at one plant in the United States operated by Saint-Gobain Abrasives and at one plant in Canada belonging to Saint-Gobain Ceramic Materials Canada. The general production trend indicates that the market is stable and relatively unchanged from previous years. Production data from these plants were withheld to avoid disclosing company proprietary data.

**Consumption.**—Crude fused aluminum oxide has many end uses. Specific applications in 2017 included antislip additives, bonded abrasives (such as abrasive grains that are made to adhere to each other and then are pressed or molded into abrasive tools), buffing and polishing compounds, coated abrasives (such as abrasive grains glued to a backing of paper or cloth), dry or wet blasting media, and tumbling media. Fused aluminum oxide in a micropowder form was used for industrial and electronic applications that require fine surface finishing. Fused aluminum oxide does not face any significant substitution threats at present because it is generally a very cost-effective abrasive. The total U.S. apparent consumption of crude fused aluminum oxide increased by 36% in 2017. Apparent consumption was calculated as imports minus exports to avoid disclosing company proprietary data.

**Prices.**—According to the USGS canvass of domestic producers, the estimated unit value of crude fused aluminum oxide produced in the United States and Canada during 2017 was \$170 per metric ton at the point of production. Prices of abrasive grain produced from these materials and sold to consumers were significantly higher.

Average unit values of fused aluminum oxide traded by the United States in 2017 were based on U.S. Census Bureau data. The average f.a.s. unit value for U.S. exports of crude fused aluminum oxide during the year was about \$3,540 per ton (table 5). Export unit values ranged from \$1,290 per ton (Canada) to \$21,000 per ton (Poland). The average import customs unit value of crude aluminum oxide during the year was \$489 per ton (table 6), with values ranging from \$94 per ton (Germany) to \$1,380 per ton (Italy), and those of ground and refined imports averaged \$1,220 per ton and ranged from \$744 per ton (Canada) to \$2,560 per ton (France).

**Foreign Trade.**—Compared with those of the previous year, crude fused aluminum oxide exports in 2017 increased by 8% to 15,400 t valued at \$54.7 million (table 5). Of the exports shipped to 40 countries, the leading destinations were Canada (44% of the tonnage), Mexico (24%), and Germany (11%).

During 2017, imports of crude fused aluminum oxide increased by 32% to 147,000 t valued at \$72.0 million compared with those of 2016 (table 6). Some of the imported crude fused aluminum oxide was thought to be refractory-grade material, which would not have been used in abrasive applications. China accounted for 67% of the crude imports received, followed by Hong Kong (18%), France (7%), and all other countries combined (8%). Imports of ground and refined fused aluminum oxide increased by 34% to 57,900 t valued at \$70.5 million. Canada accounted for 22% of the ground and refined imports received, followed by Austria and Brazil (17% each), Germany (14%), and China (8%).

**World Review.**—China was the world's leading producer of fused aluminum oxide with an estimated production capacity of 800,000 metric tons per year (t/yr); Germany ranked second with an estimated production capacity of 80,000 t/yr.

### Silicon Carbide

**Production.**—One company, Washington Mills Hennepin, Inc., in Hennepin, IL, produced abrasive-grade silicon carbide in the United States during 2017 (table 1). This company also produced similar quantities of metallurgical-grade silicon carbide. A second company, Superior Graphite Co., in Hopkinsville, KY, produced a small quantity of silicon carbide, primarily intended for use in heat-resistant products rather than abrasives. U.S. silicon carbide production was an estimated 35,000 t during 2017, and the value of production was an estimated \$25.9 million, about the same as the previous year (table 2). About 50% of the production data were reported by producers, and the remaining 50% were estimated for nonreporting producers. Estimates were based on previously reported data and industry trends.

**Consumption.**—Abrasive-grade silicon carbide has many end uses. Specific applications in 2017 included antislip abrasives, blasting abrasives, bonded abrasives, coated abrasives, polishing and buffing compounds, tumbling media,

and wire-sawing abrasives. The total quantity of silicon carbide (crude and refined) consumed in the United States in 2017 was about 166,000 t, compared with 144,000 t in 2016. Apparent consumption for silicon carbide was calculated as estimated production plus imports minus exports.

**Prices.**—According to information from industry sources, the average unit value of abrasive-grade silicon carbide at the point of manufacture was \$740 per ton in 2017, which was unchanged compared with that of 2016. The average f.a.s. unit value for U.S. crude silicon carbide exports in 2017 was \$1,870 per ton, a 15% increase compared with that of 2016. The average f.a.s. unit value for U.S. ground silicon carbide exports was \$3,950 per ton, a 4% increase compared with that of 2016 (table 5).

The average customs unit value of crude silicon carbide imports in 2017 increased by 6% to \$479 per ton. China was the largest supplier of crude silicon carbide to the United States in 2017, providing 91,300 t of material. Crude silicon carbide imports from China had an average unit value of \$455 per ton, a 1% increase compared with that of 2016. The average customs unit value of ground and refined imports from all countries was \$1,740 per ton, an increase of 7% compared with that of 2016 (table 6). Ground and refined imports from China had an average customs unit value of \$1,020 per ton, a 7% increase compared with that of 2016.

**Foreign Trade.**—In 2017, the total quantity of U.S. crude silicon carbide exports decreased by 15% to 2,210 t valued at \$4.13 million (table 5). Of the exported crude silicon carbide material shipped to 16 countries, 76% was shipped to Norway and 7% was shipped to Mexico. Exports of ground and refined silicon carbide in 2017 decreased by 8% to 3,890 t valued at \$15.3 million. Of the exported refined and ground material shipped to 33 countries, 58% was shipped to Canada, 18% to Mexico, and 10% to Japan.

In 2017, the United States imported crude silicon carbide from 9 countries and imported ground and refined silicon carbide from 24 countries. Imports of crude silicon carbide increased by 20% during the year to 103,000 t valued at \$49.4 million (table 6). Imports of silicon carbide in ground or refined form increased by 12% to 33,500 t valued at \$58.3 million. China accounted for 89% of the crude silicon carbide imports, followed by South Africa (6%) and the Netherlands (3%). China accounted for 50% of the ground and refined silicon carbide imports, followed by Brazil (19%) and Russia (10%). Some of the imports from China may have included metallurgical-grade material.

**World Review.**—In 2017, China was the world's leading producer of silicon carbide. With all grades and end uses of silicon carbide combined, China held more than a two-thirds share of the global market. China had an estimated production capacity of 455,000 t/yr of silicon carbide. Norway was the second-ranked producer of silicon carbide with an estimated production capacity of 80,000 t/yr.

## Boron Carbide

Washington Mills Electro Minerals was the only commercial producer of boron carbide in the United States during 2017

(table 1). Boron carbide was used as an abrasive for lapping and ultrasonic cutting operations previously possible only with diamond dust; it was also molded to form highly wear-resistant products, such as armor, powdered metal and ceramic forming dies, pressure-blasting nozzles, thread guides, and wire-drawing dies. Boron carbide also was used in nuclear applications, such as neutron-absorbing shielding and reactor control rods (Washington Mills Electro Minerals Corp., undated). Domestic production and pricing data for boron carbide were withheld to avoid disclosing company proprietary data, and trade data were not available.

## Outlook

Abrasives markets are influenced by activity in the manufacturing sector in the United States and by general economic trends. This is particularly true of manufacturing activities in the aerospace, automotive, furniture, housing, silicon wafers, and steel industries. Although abrasives markets are linked to these end-use manufacturing sectors, growth in these sectors may not necessarily lead to an increase in abrasives consumption.

The U.S. abrasives markets also are influenced by technological trends. Improved manufacturing technology has resulted in surface quality that requires fewer grinding and finishing operations that use abrasives. Less expensive imports coupled with higher domestic production costs and low domestic production capacity continue to challenge U.S. producers of fused aluminum oxide and silicon carbide to maintain market share. Competition from other countries and (or) localities, especially China, is likely to lead to further decreases in domestic output. China has become a dominant force in fused aluminum oxide and silicon carbide production in recent years, which has changed the supply makeup of the manufactured abrasives market. Lower priced exports from China have displaced and are expected to continue to displace manufactured abrasives produced in Europe and North America. The traditional suppliers among the Western industrialized nations are expected to continue consolidating and contracting (Lismore, 2013).

The aerospace and automotive industries are likely to continue to have significant indirect influences on demand for manufactured abrasives used by metalworking operations supporting those sectors. The housing construction sector in North America is expected to continue to have an indirect influence on demand for manufactured abrasives because of the large volumes of manufactured abrasives used in cutting and finishing wallboard and timber.

## References Cited

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- Washington Mills Electro Minerals Corp., [undated], Boron carbide (B<sub>4</sub>C): Niagara Falls, NY, Washington Mills Electro Minerals Corp. (Accessed June 20, 2017, at <https://www.washingtonmills.com/products/boron-carbide-b4c>.)

## GENERAL SOURCES OF INFORMATION

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Historical Statistics for Mineral and Material Commodities in the United States. Data Series 140.

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Abrasives, Industry and Trade Summary. U.S. International Trade Commission, May 1995.  
Industrial Minerals, monthly.

TABLE 1  
CRUDE ARTIFICIAL ABRASIVES MANUFACTURERS IN 2017<sup>1</sup>

Company	Plant location	Product
Saint-Gobain Abrasives	Huntsville, AL	Fused aluminum oxide (high-purity) and aluminum-zirconium oxide.
Saint-Gobain Ceramic Materials Canada Inc.	Chippewa, Ontario, Canada	Aluminum-zirconium oxide.
Superior Graphite Co.	Hopkinsville, KY	Silicon carbide.
Washington Mills Electro Minerals Corp.	Niagara Falls, NY	Fused aluminum oxide (high-purity) and boron carbide.
Do.	Niagara Falls, Ontario, Canada	Fused aluminum oxide (regular).
Washington Mills Hennepin, Inc.	Hennepin, IL	Silicon carbide.

Do. Ditto.

<sup>1</sup>Table includes data available through December 3, 2019.

TABLE 2  
ESTIMATED PRODUCTION OF ALUMINUM OXIDE AND SILICON CARBIDE ABRASIVES  
IN THE UNITED STATES AND CANADA<sup>1,2</sup>

Product	2016		2017 <sup>c</sup>	
	Quantity <sup>3</sup> (metric tons)	Value (thousands)	Quantity <sup>3</sup> (metric tons)	Value (thousands)
Aluminum oxide <sup>4</sup>	10,000	\$1,700	10,000	\$1,700
Silicon carbide <sup>5</sup>	35,000	25,900	35,000	25,900

<sup>c</sup>Estimated.

<sup>1</sup>Table includes data available through December 3, 2019. Data are rounded to no more than three significant digits.

<sup>2</sup>Owing to rounding, data do not match total quarterly Mineral Industry Surveys estimated data.

<sup>3</sup>Quantities are rounded to the nearest 5,000 metric tons to avoid disclosing company proprietary data.

<sup>4</sup>Regular grade accounts for about 62% of total output, and high-purity material accounts for the remainder.

<sup>5</sup>Approximately one-half of the quantity and value consists of material for metallurgical and other nonabrasive applications.

TABLE 3  
U.S. PRODUCERS OF METALLIC ABRASIVES IN 2017<sup>1</sup>

Company	Plant location	Product [shot and (or) grit]
Abrasive Materials, LLC	Hillsdale, MI	Cut wire.
Chesapeake Specialty Products, Inc.	Baltimore, MD	Steel.
Ervin Industries, Inc.	Adrian, MI	Do.
Do.	Butler, PA	Do.
FROHN North America, Inc.	Austell, GA	Cut wire.
Metaltec Steel Abrasive Co.	Canton, MI	Steel.
MLP Specialty Metals, LLC (formerly Marwas Steel Co.)	Scottsdale, PA	Do.
Peerless Metal Powders & Abrasive, LLC	Detroit, MI	Do.
Pellets LLC	Tonawanda, NY	Cut wire.
Platt Brothers & Co., The	Waterbury, CT	Do.
Premier Shot Co.	Twinsburg, OH	Do.
Wheelabrator Abrasives Inc.	Bedford, VA	Steel.
Do. Ditto.		

<sup>1</sup>Table includes data available through December 3, 2019.

TABLE 4  
PRODUCTION AND SHIPMENTS OF METALLIC ABRASIVES IN THE  
UNITED STATES, BY PRODUCT<sup>1</sup>

Product	Production		Shipments <sup>2</sup>	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
2016:				
Steel shot and grit	186,000	\$119,000	202,000	\$143,000
Cut wire shot and other <sup>c</sup>	1,890	7,070	1,820	7,770
Total	188,000	126,000	204,000	151,000
2017:				
Steel shot and grit	177,000	113,000	194,000	140,000
Cut wire shot and other <sup>c</sup>	1,980	7,450	2,140	8,750
Total	179,000	121,000	197,000	148,000

<sup>c</sup>Estimated.

<sup>1</sup>Table includes data available through December 3, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Includes reported exports.

TABLE 5  
U.S. EXPORTS OF ALUMINUM OXIDE, SILICON CARBIDE, AND METALLIC  
ABRASIVES, BY COUNTRY OR LOCALITY AND TYPE<sup>1</sup>

Country or locality	2016		2017	
	Quantity (metric tons)	Value <sup>2</sup> (thousands)	Quantity (metric tons)	Value <sup>2</sup> (thousands)
<b>Aluminum oxide, crude:</b>				
Austria	(3)	\$15	58	\$565
Brazil	269	1,340	413	2,510
Canada	6,860	9,270 <sup>r</sup>	6,730	8,700
China	293	2,380	319	2,940
Germany	1,430	12,600	1,750	14,500
India	183	1,220	325	2,130
Japan	660	7,240	659	5,380
Korea, Republic of	281	2,570 <sup>r</sup>	354	2,300
Mexico	2,980	5,270	3,660	7,050
United Kingdom	348	633	243	1,510
Other	948 <sup>r</sup>	4,080	928	7,090
Total	14,200	46,600 <sup>r</sup>	15,400	54,700
<b>Silicon carbide:</b>				
<b>Crude:</b>				
Germany	24	53	110	172
Japan	2	584	22	1,510
Korea, Republic of	11	278	--	--
Mexico	221	424	146	398
Norway	2,100	2,380	1,680	1,750
Other	230 <sup>r</sup>	470 <sup>r</sup>	252	300
Total	2,590	4,190	2,210	4,130
<b>Ground and refined:</b>				
Canada	2,030	2,790 <sup>r</sup>	2,270	2,840
China	1 <sup>r</sup>	118	47	314
Germany	20	1,340	9	1,040
Japan	387	5,280	397	4,370
Mexico	647	1,610	706	1,800
Norway	814	973	5	5
Other	324	3,990	452	4,980
Total	4,230	16,100	3,890	15,300
<b>Metallic abrasives:</b>				
Canada	5,730	5,080	5,690	5,610
China	3,020 <sup>r</sup>	6,640 <sup>r</sup>	4,440	8,880
Germany	705	1,650	787	1,710
Japan	(3)	28	18	29
Mexico	17,100	19,000 <sup>r</sup>	18,500	30,000
Spain	--	--	(3)	4
Taiwan	78	64	72	116
United Kingdom	185	262	125	180
Other	1,710 <sup>r</sup>	3,030	1,360	4,120
Total	28,600	35,700	31,000	50,700

<sup>r</sup>Revised. -- Zero.

<sup>1</sup>Table includes data available through December 3, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Free alongside ship value.

<sup>3</sup>Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 6  
U.S. IMPORTS OF ALUMINUM OXIDE, SILICON CARBIDE, AND METALLIC  
ABRASIVES, BY COUNTRY OR LOCALITY AND TYPE<sup>1</sup>

Country or locality	2016		2017	
	Quantity (metric tons)	Value <sup>2</sup> (thousands)	Quantity (metric tons)	Value <sup>2</sup> (thousands)
<b>Aluminum oxide:</b>				
<b>Crude:</b>				
Canada	9,110	\$4,730	1,330	\$1,100
China	63,600	31,700	98,700	52,200
Germany	244	129	2,570	242
Hong Kong	9,320	4,920	26,200	13,200
Italy	--	--	21	29
Singapore	4,660	2,620	--	--
Other	24,400 <sup>r</sup>	2,430 <sup>r</sup>	18,300	5,220
<b>Total</b>	<b>111,000</b>	<b>46,600</b>	<b>147,000</b>	<b>72,000</b>
<b>Ground and refined:</b>				
Austria	10,400	19,100	9,940	18,200
Brazil	7,930	6,570	9,780	8,600
Canada	4,700	4,930	12,800	9,480
China	3,760	4,900	4,810	6,320
France	1,340 <sup>r</sup>	2,480 <sup>r</sup>	1,790	4,590
Germany	7,150	12,000	7,860	12,300
Hungary	3,200	3,160	2,940	2,850
Italy	1,890	2,030	2,360	2,370
Other	2,850 <sup>r</sup>	3,870 <sup>r</sup>	5,640	5,700
<b>Total</b>	<b>43,300<sup>r</sup></b>	<b>59,000</b>	<b>57,900</b>	<b>70,500</b>
<b>Silicon carbide:</b>				
<b>Crude:</b>				
Brazil	270	284	1,500	802
China	57,700	26,000	91,300	41,600
Netherlands	14,800	3,710	3,350	591
Norway	479	1,400	639	2,040
Romania	4,580	2,290	--	--
South Africa	7,700	3,790	6,210	3,440
Other	127 <sup>r</sup>	1,260	95	939
<b>Total</b>	<b>85,700</b>	<b>38,700</b>	<b>103,000</b>	<b>49,400</b>
<b>Ground and refined:</b>				
Brazil	6,010 <sup>r</sup>	8,470 <sup>r</sup>	6,330	9,780
China	15,700	14,800 <sup>r</sup>	16,900	17,100
Germany	594	1,220	961	1,540
Japan	620	9,300	796	6,470
Norway	1,300	7,400	2,400	14,200
Russia	1,790	2,180	3,250	3,440
Vietnam	--	--	( <sup>3</sup> )	5
Other	3,970	5,040	2,920	5,720
<b>Total</b>	<b>29,900</b>	<b>48,400</b>	<b>33,500</b>	<b>58,300</b>
<b>Metallic abrasives:</b>				
Canada	10,500	7,240	10,800	9,200
China	6,350 <sup>r</sup>	4,510 <sup>r</sup>	5,660	4,290
Germany	3,340	2,800	4,620	4,570
Japan	2,490 <sup>r</sup>	4,210 <sup>r</sup>	2,130	4,910
Korea, Republic of	1,000	607	901	413
Sweden	26,800	5,230	20	34
Thailand	1,380	3,100	1,990	3,930
Other	2,230 <sup>r</sup>	1,700 <sup>r</sup>	3,590	2,820
<b>Total</b>	<b>54,200<sup>r</sup></b>	<b>29,400<sup>r</sup></b>	<b>29,700</b>	<b>30,200</b>

<sup>r</sup>Revised. -- Zero.

<sup>1</sup>Table includes data available through December 3, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Customs value.

<sup>3</sup>Less than ½ unit.

Source: U.S. Census Bureau.