



# 2016 Minerals Yearbook

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**MICA [ADVANCE RELEASE]**

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# MICA

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The United States remained one of the world's leading mica producers, with scrap and flake mica production of 30,900 metric tons (t), a decrease of 5% compared with that of 2015 (tables 1, 11). The quantity of ground mica sold or used by producers increased by 15% to 61,800 t valued at \$21.4 million (tables 1, 2). Essentially all sheet mica used in the United States was imported. India, China, Brazil, and Belgium were, in decreasing order by quantity, the major suppliers (table 7, 9). Consumption of mica splittings was 261 t, virtually unchanged from that of 2015 (tables 1, 3). World production of mica was estimated to have increased by 7% to 294,000 t in 2016 from 275,000 t in 2015 (table 11).

Mica's value is based on several of its unique physical properties. The crystalline structure of mica forms layers that can be split or delaminated into thin sheets. These sheets are chemically inert, dielectric, elastic, flexible, hydrophilic, insulating, lightweight, platy, reflective, refractive, resilient, and range in opacity from transparent to opaque. Mica is stable when exposed to electricity, light, moisture, and extreme temperatures. The mica group represents 37 phyllosilicate minerals that have a layered or platy texture. The commercially important micas are muscovite and phlogopite, which are used in a variety of applications. Muscovite is the principal mica used by the electrical industry to make mica-based capacitors that can operate in environments with temperatures and (or) frequencies that are too high for polypropylene capacitors. Phlogopite mica is used in plastic composites for automotive applications because of its dimensional stability, increased stiffness, and improved heat distortion temperature. Muscovite and phlogopite are used in sheet and ground forms (Rieder and others, 1998, p. 43–45).

## Production

In 2016, seven companies produced scrap and flake mica in four States with the largest quantity produced in Georgia. Production of scrap and flake mica in the United States decreased to 30,900 t, 5% less than that of 2015 (tables 1, 11). Seven companies produced 61,800 t of ground mica in 2016 (tables 1, 2). Ground mica was produced from domestic and imported scrap and flake mica at eight grinding plants in three States; five plants produced dry-ground mica, and three produced wet-ground mica. The U.S. Geological Survey obtained the data in this report through voluntary surveys of U.S. scrap and flake and ground mica producers, and responses were received from three out of eight companies.

## Consumption

**Ground Mica.**—The leading domestic use of ground mica was in joint compound for filling and finishing seams and blemishes in gypsum wallboard (drywall), which accounted

for 50% of ground mica sold or used by producers in 2016 (table 2). The mica acts as a filler and extender, provides smooth consistency, improves the workability of the compound, and provides resistance to cracking.

The second-leading use of ground mica shown in table 2 was "Other," which included several end-use categories for which data were withheld to avoid disclosing company proprietary data and (or) amounts were very small in comparison to other specified end uses. The "Other" category included mica used in electrical insulation, roofing, rubber, textile and decorative coatings, welding rods, well-drilling mud, and miscellaneous uses. These end uses accounted for 26% of ground mica consumption.

Consumption in paint accounted for 21% of the ground mica used in 2016. In the paint industry, ground mica is used as a pigment extender that also facilitates suspension, reduces chalking, prevents shrinking and shearing of the paint film, increases resistance of the paint film to water penetration and weathering, and brightens the tone of colored pigments. Mica also promotes paint adhesion in aqueous and oleoresinous formulations.

The plastics industry used ground mica as an extender and filler, especially in parts for automobiles as lightweight insulation to suppress sound and vibration. In 2016, consumption of ground mica in plastic applications accounted for 3% of the total. Mica is used in plastic automobile fascia and fenders as a reinforcing material, improving mechanical properties and increasing dimensional stability, stiffness, and strength. Mica-reinforced plastics also have high-heat dimensional stability, reduced warpage, and good surface properties.

Mica was used as an additive to drilling muds by the well-drilling industry. Coarsely ground mica flakes help prevent the loss of circulation by sealing porous sections of the drill hole. During 2016, the number of drill rigs operating in the United States began the year at 664 rigs and ended at 658; however, the rig count was lower during much of the year, declining to 404 in May. The average weekly drill rig count for 2016 was 509 operating rigs compared with an average of 978 in 2015 (Baker Hughes Inc., 2017).

Other uses for ground mica are in the rubber industry as an inert filler and mold release compound. As a rubber additive, mica reduces gas permeability and improves resiliency. The platy nature of mica enhances release performance in the manufacture of molded rubber products. As a surface coating in the production of rolled roofing and asphalt shingles, mica prevents the sticking of adjacent surfaces. Mica is used in decorative coatings on wallpaper, concrete, stucco, and tile surfaces. It also is used as an ingredient in flux coatings on welding rods, in some special greases, and in coatings for core and mold release compounds, facing agents, and mold washes in foundry applications (MICAMAFCO, undated).

Ground phlogopite mica is used in automotive brake linings and clutch plates to reduce noise and vibration (asbestos substitute); as sound-absorbing insulation for coatings and polymer systems; in reinforcing additives for polymers to increase strength and stiffness and to improve stability to heat, chemicals, and ultraviolet radiation; in heat shields and temperature insulation; in industrial coating additives to decrease the permeability of moisture and hydrocarbons; and in polar polymer formulations to increase the strength of epoxies, nylons, and polyesters (Imerys Performance Minerals, undated).

Wet-ground mica, which retains the brilliancy of its cleavage faces, is used primarily in pearlescent paints by the automotive industry. In the cosmetics industry, its reflective and refractive properties make mica an important ingredient in blushes, eyeliner, eyeshadow, foundation, hair and body glitter, lipstick, lip gloss, mascara, moisturizing lotions, and nail polish. Mica is added to latex balloons to provide a colored shiny surface.

Natural mica is used by the Taos and Picuris Pueblos Indians in north-central New Mexico to make pottery. The pottery is made from weathered Precambrian mica schist and has flecks of mica throughout the vessels. Tewa Pueblo pottery is made by coating the clay with mica to provide a dense, glittery micaceous finish over the entire object.

**Built-Up Mica.**—In 2016, the total quantity of built-up mica that was consumed or shipped was about 273 t (table 4). Segment plate and molding plate were the major end-use products and accounted for 53% and 17% of the total, respectively.

Muscovite and phlogopite splittings were fabricated into various built-up mica products by seven companies that operated seven plants in five States. Produced by mechanized or hand setting of overlapping splittings and alternate layers of binders and splittings, built-up mica is used primarily as an electrical insulation material. Mica insulation is used in high-temperature and fire-resistant power cable in aluminum plants, blast furnaces, critical wiring circuits (for example, defense systems, fire and security alarm systems, and surveillance systems), heaters and boilers, lumber kilns, metal smelters, and tanks and furnace wiring. Specific high-temperature mica-insulated wire and cable is rated to work for up to 15 minutes in molten aluminum, glass, and steel. Major products are bonding materials; flexible, heater, molding, and segment plates; mica paper; and tape.

Flexible plate (cold) is used in electric motor and generator armatures, field coil insulation, and magnet and commutator core insulation. In 2016, mica consumption in flexible plate was an estimated 14 t valued at \$150,000.

Heater plate is used where high-temperature insulation is required. Consumption of built-up mica used in making heater plates decreased to an estimated 0.4 t valued at \$3,000.

Molding plate is sheet mica from which V-rings are cut and stamped for use in insulating the copper segments from the steel shaft ends of a commutator. Molding plate is also fabricated into tubes and rings for insulation in armatures, motor starters, and transformers. Consumption for molding plate increased slightly to an estimated 46 t in 2016 valued at \$440,000.

Segment plate acts as insulation between the copper commutator segments of direct-current universal motors and generators. Consumption of mica in the production of segment plate was estimated to be about 145 t in 2016. Phlogopite

built-up mica is preferred because it wears at the same rate as the copper segments. Although muscovite has a greater resistance to wear, it causes uneven ridges that may interfere with the operation of a motor or generator.

Some types of built-up mica have bonded splittings reinforced with glass, linen, muslin, plastic, silk, or special paper. These products are very flexible and are produced in wide, continuous sheets that are either used as is, rolled, cut into ribbons or tapes, or trimmed to specified dimensions. Built-up mica products may also be corrugated or reinforced by multiple layering.

**Mica Paper (Reconstituted Mica).**—Primary uses for mica paper were the same as those for built-up mica. Five companies consumed scrap mica to produce mica paper for electrical and insulation applications. The principal source of the scrap was India.

**Sheet Mica.**—Sheet mica was used principally in the electronics and electrical industries. Its usefulness in these applications is derived from its unique electrical and thermal insulating properties and its mechanical properties, which allow it to be cut, punched, stamped, and machined to close tolerances.

Mica splittings represented the largest part of the sheet mica industry in the United States. Consumption of muscovite and phlogopite splittings was 261 t in 2016, about the same as that in 2015 (table 3). Muscovite splittings from India accounted for essentially all domestic consumption.

Only high-quality muscovite film mica, which is known as either India ruby mica or ruby muscovite mica, is used as a dielectric in capacitors. The highest quality mica film is used to manufacture capacitors for calibration standards. The next lower grade is used in transmitting capacitors. Receiving capacitors use a slightly lower grade of high-quality muscovite.

The leading use of block mica is as an electrical insulator in electronic equipment. Consumption of muscovite block mica was withheld to protect company proprietary data. High-quality block mica is processed to line the gauge glasses of high-pressure steam boilers because of its flexibility, transparency, and resistance to heat and chemical attack. Other uses include diaphragms for oxygen breathing equipment, marker dials for navigation compasses, optical filters, pyrometers, retardation plates in helium-neon lasers, thermal regulators, and stove and kerosene heater windows. Specialized applications for sheet mica are found in aerospace components in laser devices, in medical electronics, in missile systems, in optical instrumentation, in radar systems, and for radiation detector windows that are transparent to alpha emissions (Geiger-Mueller tubes).

## Stocks

In 2016, industry stocks of muscovite and phlogopite mica splittings, estimated at 76 t, were slightly more than those in 2015 (table 3). The industry stocks of muscovite block mica were withheld to avoid disclosing company proprietary data.

## Prices

Sheet mica prices vary with grade and can range from less than \$1 per kilogram for low-quality mica to more than \$2,000 per kilogram for the highest quality. The estimated average unit values of mica splittings consumed in the

United States in 2016 were muscovite splittings, \$1.57 per kilogram, and phlogopite splittings, \$16.77 per kilogram. The estimated average unit values for block mica consumed in the United States in 2016 were withheld to avoid disclosing company proprietary data.

In 2016, the average unit value of scrap and flake mica produced in the United States, which included high-quality sericite, was estimated to be \$107 per metric ton (table 1). The average value of dry-ground mica was estimated to be \$331 per metric ton, and the average value of wet-ground mica was estimated to be \$411 per metric ton (tables 1, 2).

## Foreign Trade

According to data from the U.S. Census Bureau, the value of U.S. exports of mica decreased to \$25.3 million, and the quantity decreased to 7,030 t (table 10). Domestic ground mica (powder) exports decreased by 15% compared with those of 2015 to 6,020 t in 2016. Ground mica exports decreased in value to \$8.4 million in 2016 from \$9.6 million in 2015. Exports of crude and rifted mica decreased by 37% to 207 t in 2016 from 330 t in 2015 (table 5); the value of crude and rifted mica exports increased by 35% in 2016 to \$449,000 from \$334,000 in 2015. Worked and unworked sheet mica exports decreased to 803 t in 2016 from 968 t in 2015, and the value decreased to \$16.8 million in 2016 from \$20.7 million in 2015 (table 10).

U.S. imports of all mica totaled 33,600 t and were valued at \$37.9 million (table 10). In 2016, total imports for consumption of unworked split block, film, splittings, and mica sheet categorized as "Other" decreased by 14% to 3,990 t, almost all of which consisted of unworked low-value scrap mica (less than \$1.00 per kilogram) (table 7). The low-value mica is used as a dry-ground additive for drywall compound, fillers, and paints. U.S. imports of worked and unworked sheet mica decreased to 2,060 t in 2016 from 2,130 t in 2015, and the value increased to \$17.5 million in 2016 from \$16.8 million in 2015. In 2016, 27,200 t of powder mica was imported, mostly from Canada, China, Finland, and Japan, 3% less than that in 2015 (table 8). Worked mica imports were 2,000 t, about equal to those of 2015 (table 10).

## World Review

World production of mica was estimated to be 294,000 t, up by 7% compared with that of 2015 (table 11). Finland was the leading producer of mica, followed by Turkey, the United States, China, and France. In 2016, Canada was the leading supplier of mica to the United States, followed by China, India, and Brazil.

## Outlook

The major markets for ground mica—drywall joint compounds and paints—are mature and relatively stable, with growth tied to housing construction and interest rates. Despite slow economic growth in 2016, production of ground mica is expected to remain stable or increase slightly in the long term. Demand is also affected by automobile production because interior and exterior parts typically contain dry-ground mica or engineered mica composites, and exterior surfaces may be painted with wet-ground pearlescent pigments and mica-

containing coatings. North American automobile production is forecast to decrease by about 3%, or about 210,000 units, in 2017 (J.D. Power and Associates, 2017).

Demand for ground mica in smaller specialty markets such as coated micas, cosmetics, nylon and polyester resins, and polypropylene composites, is expected to resume an annual growth rate slightly higher than that of the entire ground mica industry.

Consumption of block mica is expected to increase slowly at about 1% per year as demand increases in a few specialty markets, such as electronics. A shortage of high-quality block mica is expected to continue because of the generally low percentage of high-quality mica in deposits currently being mined, mostly from pegmatites.

Consumption of mica splittings, which is the principal type of sheet mica consumed in the United States, has been in the range of 200 to 300 metric tons per year in recent years. With no potential new uses apparent and many substitute materials being used, substantial growth is not expected.

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## GENERAL SOURCES OF INFORMATION

### U.S. Geological Survey Publications

- Historical Statistics for Mineral and Material Commodities in the United States. Data Series 140.
- Mica (Natural). Ch. in Mineral Commodity Summaries, annual.
- Mica. Ch. in United States Mineral Resources, Professional Paper 820, 1973.

### Other

- Economics of Mica, The (8th ed.). Roskill Information Services Ltd., 1997.
- Mica. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.

TABLE 1  
SALIENT MICA STATISTICS<sup>1</sup>

		2012	2013	2014	2015	2016
United States:						
Production, sold or used by producers:						
Scrap and flake mica:						
Quantity	metric tons	47,500	48,100	48,200	32,600	30,900
Value	thousands	\$6,070	\$5,940	\$5,640	\$4,640	\$3,310
Ground mica:						
Quantity	metric tons	78,500	79,200	79,400	53,700	61,800
Value	thousands	\$23,500	\$23,600	\$24,300	\$16,700	\$21,400
Prices:						
Scrap and flake mica	dollars per metric ton	128	124	117	142	107
Ground:						
Dry	do.	281	279	285	290	331
Wet	do.	360	360	369	375	411
Sheet, muscovite and phlogopite:						
Block	dollars per kilogram	145	129	148	W	W
Splittings	do.	1.72	1.72	1.70	1.76	1.57
Consumption:						
Block, muscovite:						
Quantity	kilograms	909	854	912	W	W
Value	thousands	\$160	\$152	\$162	W	W
Splittings, all types:						
Quantity	metric tons	285	269	268	260	261
Value	thousands	\$490	\$463	\$455	\$457	\$409
Exports	metric tons	7,560	7,530	9,110	8,350	7,030
Imports	do.	29,600	32,800	35,200	35,300 <sup>r</sup>	33,600
World, production	do.	340,000 <sup>r</sup>	310,000 <sup>r</sup>	272,000 <sup>r</sup>	275,000 <sup>r</sup>	294,000

<sup>r</sup>Revised. do. Ditto. W Withheld to avoid disclosing company proprietary data.

<sup>1</sup>Table includes data available through April 5, 2018. Data are rounded to no more than three significant digits.

TABLE 2  
GROUND MICA SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY END USE  
AND METHOD OF GRINDING<sup>1,2</sup>

	2015			2016		
	Quantity (metric tons)	Value (thousands)	Unit value	Quantity (metric tons)	Value (thousands)	Unit value
End use:						
Joint compound	28,900	\$7,750	\$268	30,700	\$10,100	\$329
Paint	11,400	4,540	400	13,200	5,150	392
Plastics	1,430	946	662	2,090	1,340	640
Other <sup>3</sup>	12,000	3,420	285	15,900	4,830	304
Total	53,700	16,700	310	61,800	21,400	347
Method of grinding:						
Dry	W	W	290	W	W	331
Wet	W	W	375	W	W	411

W Withheld to avoid disclosing company proprietary data.

<sup>1</sup>Table includes data available through April 5, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Domestic and some imported scrap. Low-quality sericite is not included.

<sup>3</sup>Includes mica used for molded electrical insulation, roofing, rubber, textile and decorative coatings, welding rods, well drilling mud, and miscellaneous.

TABLE 3  
ESTIMATED CONSUMPTION AND STOCKS OF  
MICA SPLITTINGS IN THE UNITED STATES<sup>1</sup>

Year	Consumption		Stocks on December 31 (metric tons)
	Quantity (metric tons)	Value (thousands)	
2015	260	\$457	75
2016	261	409	76

<sup>1</sup>Table includes data available through April 5, 2018.

TABLE 4  
ESTIMATED BUILT-UP MICA SOLD OR USED IN THE UNITED STATES, BY PRODUCT<sup>1,2</sup>

	2015		2016	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Flexible plate (cold)	14	\$160	14	\$150
Heater plate	2	26	(3)	3
Molding plate	45	461	46	440
Segment plate	142	284	145	201
Other	65	305	67	283
Total	269	1,240	273	1,080

<sup>1</sup>Table includes data available through April 5, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Consists of alternating layers of binder and irregularly arranged and partly overlapped splittings.

<sup>3</sup>Less than ½ unit.

TABLE 5  
U.S. EXPORTS OF CRUDE AND RIFTED MICA, MICA POWDER, AND WASTE, BY COUNTRY OR LOCALITY<sup>1</sup>

Country or locality	Crude and rifted							
	Less than \$1 per kilogram		More than \$1 per kilogram		Powder		Waste	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
2015	273	\$81	57	\$253	7,100	\$9,570	6	\$8
2016:								
Algeria	--	--	--	--	126	21	--	--
Belgium	--	--	--	--	146	533	--	--
Brazil	--	--	--	--	586	839	--	--
Canada	91	26	--	--	572	1,160	97	23
China	--	--	43	118	209	653	--	--
Colombia	--	--	16	17	714	696	--	--
Germany	--	--	--	--	483	1,210	--	--
Japan	--	--	2	4	393	683	--	--
Korea, Republic of	--	--	1	20	300	296	19	33
Mexico	--	--	--	--	2,100	1,460	--	--
Netherlands	--	--	--	--	99	123	--	--
Other	--	--	55	266	296	766	--	--
Total	91	26	116	423	6,020	8,430	116	56

-- Zero.

<sup>1</sup>Table includes data available through April 5, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 6  
U.S. EXPORTS OF WORKED MICA, BY COUNTRY OR LOCALITY<sup>1</sup>

Country or locality	Plates, sheets		Other	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
2015	532	\$15,400	378	\$5,100
2016:				
Austria	--	--	19	95
Brazil	40	1,070	6	228
Canada	67	2,350	71	1,950
China	1	47	30	197
Germany	8	290	132	721
Japan	7	216	8	102
Korea, Republic of	20	715	2	137
Mexico	115	3,520	27	788
Russia	9	18	--	--
Spain	5	187	2	62
Switzerland	60	1,710	--	--
Taiwan	7	232	6	180
United Kingdom	3	92	2	40
Other	18	703	22	742
Total	361	11,200	326	5,250

-- Zero.

<sup>1</sup>Table includes data available through April 5, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 7  
U.S. IMPORTS FOR CONSUMPTION OF CRUDE AND RIFTED MICA, BY COUNTRY OR LOCALITY<sup>1</sup>

Country or locality	Split block		Splittings		Other			
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Less than \$1 per kilogram		More than \$1 per kilogram	
					Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
2015	17	\$85	67	\$142	4,510	\$2,370	27	\$210
2016:								
Brazil	(2)	3	--	--	960	691	--	--
India	4	11	56	130	2,970	1,650	--	--
Italy	--	--	--	--	--	--	(2)	3
Japan	--	--	(2)	3	--	--	--	--
Sweden	--	--	(2)	4	--	--	--	--
Total	4	15	57	137	3,930	2,340	(2)	3

-- Zero.

<sup>1</sup>Table includes data available through April 5, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 8  
U.S. IMPORTS FOR CONSUMPTION OF MICA POWDER AND WASTE, BY COUNTRY OR LOCALITY<sup>1</sup>

Country or locality	Powder		Waste	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
2015	28,000	\$17,600	659	\$490
2016:				
Canada	14,100	8,070	--	--
China	9,590	2,370	--	--
Finland	1,540	712	--	--
India	246	436	393	290
Japan	960	4,450	--	--
United Kingdom	330	411	--	--
Other	423	1,320	--	--
Total	27,200	17,800	393	290

-- Zero.

<sup>1</sup>Table includes data available through April 5, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 9  
U.S. IMPORTS FOR CONSUMPTION OF WORKED MICA, BY COUNTRY OR LOCALITY<sup>1</sup>

Country or locality	Plates, sheets		Other	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
2015	1,460	\$10,600	554	\$5,830
2016:				
Austria	21	812	100	2,310
Belgium	195	2,490	--	--
Brazil	245	1,550	142	235
China	614	2,700	357	1,570
Other	265	3,930	64	1,710
Total	1,340	11,500	663	5,820

-- Zero.

<sup>1</sup>Table includes data available through April 5, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 10  
SUMMATION OF U.S. MICA TRADE DATA<sup>1</sup>

	Scrap and flake mica				Sheet mica			
	Powder		Waste		Unworked		Worked	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Exports:								
2015	7,100	\$9,570	279	\$89	57	\$253	911	\$20,500
2016	6,020	8,430	207	82	116	423	687	16,400
Imports for consumption:								
2015	28,000	17,600	5,170	2,860	112	437	2,010	16,400
2016	27,200	17,800	4,320	2,630	61	155	2,000	17,300

<sup>1</sup>Table includes data available through April 5, 2018. Data are rounded to no more than three significant digits.

Source: U.S. Census Bureau.



TABLE 11  
MICA: WORLD PRODUCTION, BY COUNTRY OR LOCALITY<sup>1</sup>

(Metric tons)

Country or locality <sup>2</sup>	2012	2013	2014	2015	2016
Argentina, all grades <sup>c</sup>	5,790 <sup>r</sup>	10,000 <sup>r</sup>	7,500 <sup>r</sup>	7,500 <sup>r</sup>	7,500
Austria	3,400	3,400	3,400	3,400	3,400 <sup>e</sup>
Brazil	522	11,520	10,313	10,000	10,000 <sup>e</sup>
Canada	NA	NA	NA	NA	20,000 <sup>e</sup>
China <sup>c</sup>	56,000 <sup>r</sup>	41,000 <sup>r</sup>	25,600 <sup>r</sup>	25,000 <sup>r</sup>	25,000
Finland:					
Biotite	27,493	42,150	41,997	38,169 <sup>r</sup>	52,310
Concentrate	12,112	11,244	11,973	11,836 <sup>r</sup>	10,843
Total	39,605	53,394	53,970	50,005 <sup>r</sup>	63,153
France <sup>c</sup>	20,000	20,000	20,000	20,000	20,000
India:					
Crude	1,507 <sup>r</sup>	1,403 <sup>r</sup>	962 <sup>r</sup>	900 <sup>r,e</sup>	1,000 <sup>e</sup>
Scrap and waste	11,128 <sup>r</sup>	17,992 <sup>r</sup>	16,218 <sup>r</sup>	13,800 <sup>r,e</sup>	14,000 <sup>e</sup>
Total	12,635 <sup>r</sup>	19,395 <sup>r</sup>	17,180 <sup>r</sup>	14,702 <sup>r</sup>	15,000 <sup>e</sup>
Iran <sup>e,3</sup>	7,000	7,000	7,000	7,000	7,000
Korea, Republic of, all grades	25,594	25,143	24,200 <sup>r,e</sup>	17,405 <sup>r</sup>	18,000 <sup>e</sup>
Madagascar, phlogopite	12,556 <sup>r,4</sup>	9,782 <sup>r</sup>	9,782 <sup>r</sup>	19,000 <sup>e</sup>	18,000 <sup>e</sup>
Malaysia	3,967	4,242	5,689 <sup>r</sup>	4,788 <sup>r</sup>	5,000 <sup>e</sup>
Mexico, all grades <sup>c</sup>	160	160	160	160	160
Nigeria	NA	NA	1,077	570	79 <sup>e</sup>
Peru	99	156	109	115	111 <sup>e</sup>
Russia	100,000 <sup>e</sup>	50,000 <sup>r,e</sup>	10,000 <sup>r,e</sup>	4,823 <sup>r</sup>	3,701
South Africa, ground and scrap	400	309	83	29 <sup>r</sup>	8 <sup>e</sup>
Spain	3,518	3,462	4,049 <sup>r</sup>	4,000 <sup>r</sup>	4,000 <sup>e</sup>
Sri Lanka, schist	1,260	1,493	1,500	2,000 <sup>r</sup>	2,000 <sup>e</sup>
Sudan	324	500	500 <sup>r,e</sup>	500 <sup>r,e</sup>	500 <sup>e</sup>
Taiwan	-- <sup>r</sup>	-- <sup>r</sup>	5,016	8,287 <sup>r</sup>	1,879 <sup>e</sup>
Turkey:					
Illite	--	800	16,200	44,000 <sup>r</sup>	39,000 <sup>e</sup>
Other	1,253	276 <sup>r</sup>	1,240 <sup>r</sup>	637 <sup>r</sup>	1,000 <sup>e</sup>
Total	1,253	1,076 <sup>r</sup>	17,440 <sup>r</sup>	44,637 <sup>r</sup>	40,000 <sup>e</sup>
United States, scrap and flake <sup>5</sup>	47,500	48,100	48,200	32,600	30,900
Zimbabwe	1,000	1,000	1,000	1,000	1,000 <sup>e</sup>
Grand total	340,000 <sup>r</sup>	310,000 <sup>r</sup>	272,000 <sup>r</sup>	275,000 <sup>r</sup>	294,000

<sup>c</sup>Estimated. <sup>r</sup>Revised. NA Not available. -- Zero.

<sup>1</sup>Table includes data available through November 23, 2017. All data are reported unless otherwise noted. Grand totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>In addition to the countries and (or) localities listed, Egypt, Pakistan, Romania, and Sweden are known to have produced mica, but available information was inadequate to make reliable estimates of output levels.

<sup>3</sup>Production is based on fiscal year, with a starting date of March 21.

<sup>4</sup>Reported exports.

<sup>5</sup>Does not include, if any, U.S. production of low-quality sericite and sheet mica.