

MICA

By James B. Hedrick

Mica is a group of phyllosilicate minerals that have a layered or platy texture. The commercially important micas are muscovite and phlogopite. Composed of tetrahedral-octahedral-tetrahedral layers, the mica group is characterized by partial substitution of aluminum for silicon in the silicate tetrahedron. This substitution in the laminar structure provides charges to bind interlayer univalent and divalent cations, typically potassium, magnesium, calcium, and sodium. Layering in the univalent (potassium, sodium) or "true" micas imparts perfect basal cleavage, allowing crystals to be split into very thin sheets that are tough and flexible. Layering in the divalent or "brittle" micas also imparts perfect basal cleavage; however, the greater bond strengths make them more brittle and less flexible.

The value of mica is in its unique physical properties. The crystalline structure of mica forms minerals that can be split or delaminated into thin sheets that are platy, flexible, elastic, transparent to opaque, resilient, reflective, refractive, dielectric, chemically inert, insulating, lightweight, hydrophilic, nonconductive to heat and electricity, and stable to temperature extremes, electricity, light, and moisture. Muscovite is the principal mica used based on its greater abundance and superior electrical properties. Phlogopite remains stable at higher temperatures and is used in applications where a combination of high heat stability and electrical properties is required. Muscovite and phlogopite are used in both sheet and ground forms.

In 1996, about 97,000 metric tons of scrap and flake mica was produced in the United States, 10% less than that in 1995. (See table 1.) Ground mica sales were 103,000 tons valued at \$33.6 million, an increase in tonnage of 5%. Essentially all of the sheet mica used in the United States was imported, primarily from India. Consumption of muscovite block mica decreased 11% to 5 tons, valued at \$383,000. Consumption of mica splittings increased from 713 tons in 1995 to 859 tons in 1996. After a 7% decrease in 1995, worked and unworked sheet mica exports decreased 11% to 831 tons while the value declined 7% to \$11.2 million. The value of 6,330 tons of imports of worked and unworked sheet mica increased 4% to \$13.1 million.

Legislation and Government Programs

The calendar year 1996 included the U.S. Government fiscal years for 1996 and 1997. Public Law 104-106, the National Defense Authorization Act for Fiscal Year 1996, was enacted in February 1996. It did not change the previous authorizations for the disposal of specific mica stocks in the National Defense Stockpile (NDS). The National Defense Authorization Act for Fiscal Year 1997, Public Law 104-201, was enacted on

September 23, 1996. It did not change the previous authorizations for disposal of specific mica stocks.

Stocks of mica classified as excess to goal at the end of fiscal year 1996 (September 30, 1996) included 1,263,553 kilograms of muscovite block (stained and better), 115,468 kilograms of muscovite film (1st and 2nd qualities), 6,002,010 kilograms of muscovite splittings, and 545,754 kilograms of phlogopite splittings. Phlogopite block in the stockpile is 84,265 kilograms below the goal of 143,570 kilograms. No phlogopite block was purchased during fiscal year 1996. (See table 2.)

Production

Domestic mine production data for mica are developed by the U.S. Geological Survey from four separate voluntary surveys. Of the 11 operations to which the *Crude Scrap and Flake Mica* production form was sent (excludes low-grade sericite production), 7 operations, or 64%, responded. Of the 16 operations to which the *Ground Mica* form was sent, 14 operations, or 87%, responded, representing 87% of the domestic ground mica production noted in table 1 (excludes low-grade ground sericite production). Of the five surveyed operations to which the *Mica Block and Film* consumption form was sent, three operations, or 60%, responded. Of the nine surveyed operations to which the *Mica Splittings* consumption form was sent, five operations, or 56%, responded. Consumption for the nonrespondents was estimated using prior-year production data. Individual company production and consumption data are withheld to avoid disclosing company proprietary data.

Scrap and Flake Mica.—Eight domestic companies with 11 mines in 5 States produced scrap and flake mica in 1996. The United States was the world's largest producer with 96,600 tons. North Carolina remained the major producing State, with 64% of domestic production. The remainder was produced in Georgia, New Mexico, South Carolina, and South Dakota. Most mica was recovered from mica schist, high-quality sericite schist, weathered pegmatites, and as a coproduct of feldspar, kaolin, and lithium. (See table 3.)

The scrap and flake mica producers, in alphabetical order, were Aspect Mineral, Micaville, NC; The Feldspar Corp., Spruce Pine, NC; FMC Corp. Lithium Division, Bessemer City, NC; FMP Division of The Mearl Corp., Hartwell, GA; KMG Minerals Division of Franklin Industries Inc., Kings Mountain, NC and Velarde, NM; K-T Feldspar Corp., Spruce Pine, NC; The Mineral Mining Co., Kershaw, SC; and Pacer Corp., Custer, SD.

Ground Mica.—Nine companies operated 14 grinding

plants in five States. Ten plants produced dry-ground mica and four plants produced wet-ground mica. The four largest ground mica companies, including one company with four plants, accounted for 74% of the total of 103,000 tons. (See table 4.)

Dry-ground mica producers, in alphabetical order, were: Asheville Mica Co., Asheville, NC; KMG Minerals Division of Franklin Industries Inc., Kings Mountain, NC, and Velarde, NM; Mineral Mining Co. Inc., Kershaw, SC; Pacer Corp., Custer, SD; Piedmont Minerals, Hillsborough, NC; Spartan Minerals Corp., a subsidiary of FMC Corp. Lithium Division, Pacolet, SC; and USG Corp., Spruce Pine, NC. Wet-ground mica producers, in alphabetical order, were: Aspect Mineral, Bakersville, NC; the FMP Division of The Mearl Corp., Hartwell, GA, and Franklin, NC; and KMG Minerals Division of Franklin Industries Inc., Kings Mountain, NC.

Consumption

Statistics on domestic mica consumption are developed by surveying various processors and manufacturers, evaluating import-export data, and analyzing Government stockpile shipments.

Sheet Mica.—Sheet mica is used principally in the electronic 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.

The largest use of block mica is as an electrical insulator in electronic equipment. High-quality mica is also used to line the gauge glasses of high-pressure steam boilers because of its transparency, flexibility, and resistance to heat and chemical attack. Other uses include diaphragms for oxygen-breathing equipment, marker dials for navigation compasses, optical filters, retardation plates in helium-neon lasers, pyrometers, thermal regulators, and stove and kerosene heater windows. Specialized applications for sheet mica are found in ground and air-launched missile systems, optical instrumentation, laser devices, medical electronics for radiation treatment, radar systems, and aerospace components.

Muscovite film mica is used as a dielectric in capacitors. Only high-quality mica is used in this application. The highest grade film is used in capacitors that are manufactured as calibration standards. The next grade down is used in transmitting capacitors. Receiving capacitors use a slightly lower grade of high-quality muscovite.

Consumption of muscovite block (ruby and nonruby) totaled 4,640 kilograms, an 8% decrease from that of 1995. Stained and lower-than-stained quality remained in greatest demand, accounting for 91.4% of ruby mica block. Consumption of nonruby mica block was split 74% for good quality and 26% for stained quality. Block mica use in 1996 was slightly higher than that in 1995.

Five companies continued to consume muscovite block and film in five plants in four States: two in North Carolina and one each in New Jersey, Ohio, and Virginia.

Mica splittings represents the largest part of the sheet mica industry in the United States. Muscovite and phlogopite splittings are used to make built-up mica. Consumption of muscovite and phlogopite splittings increased 20.6% in 1996 to 859 tons. (See table 6.) Muscovite splittings from India accounted for more than 95% of domestic consumption. The remainder of consumption was primarily phlogopite splittings imported from Madagascar and muscovite from other countries. The splittings were fabricated into various built-up mica products by nine companies operating nine plants in seven States.

Built-Up Mica.—Produced by mechanical or hand setting of overlapping splittings and alternate layers of binders and splittings, built-up mica is primarily used as an electrical insulation material. Major products are molding plate, segment plate, flexible plate, tape, heater plate, mica paper, and bonding materials. (See table 7.)

Segment plate acts as insulation between the copper commutator segments of direct-current universal motors and generators. Phlogopite built-up mica is preferred because it will wear at the same rate as the copper segments. Muscovite has a greater resistance to wear, causing uneven ridges that may interfere with the operation of a motor or generator. Consumption of segment plate was 172 tons in 1996, essentially the same as in 1995.

Molding plate is sheet from which V-rings are cut and stamped for use in insulating the copper segments from the steel shaft ends at the ends of a commutator. Molding plate is also fabricated into tubes and rings for insulation in transformers, armatures, and motor starters. Consumption of molding plate decreased slightly from 181 tons in 1995 to 179 tons in 1996.

Flexible plate is used in electric motor and generator armatures, field coil insulation, and magnet and commutator core insulation. Mica consumption in flexible plate increased from 107 tons in 1995 to 123 tons in 1996.

Heater plate is used where high-temperature insulation is required. Consumption of mica in heater plate declined slightly in 1996.

Tape, powdered mica paper, and silicone and other bonding materials consumption was 139 tons, 3.7% more than that in 1995.

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

Total consumption of built-up mica that was consumed or shipped was 633 tons, an increase of 3% from the 1995 level. Segment plate and molding plate were the major end products and accounted for 27% and 28% of the total, respectively.

Reconstituted Mica (Mica Paper).—Primary uses for mica paper are the same as those for built-up mica. Three companies consumed scrap mica to produce mica paper. The principal source of the scrap was India. Manufacturing companies in

1996 were: Corona Films Inc., West Townsend, MA; General Electric Co., Coshocton, OH; and U.S. Samica Corp., Rutland, VT.

Ground Mica.—The largest domestic use of dry ground mica was in joint compound for filling and finishing seams and blemishes in gypsum wall board (drywall). The mica acts as a filler and extender, provides a smooth consistency, improves the workability of the compound, and imparts resistance to cracking. Joint compound accounted for 54.3% of dry-ground mica consumption.

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 both aqueous and oleoresinous formulations. Consumption of dry-ground mica in paint, its second largest use, accounted for 18.2% of the 1996 total.

Ground mica is used in the well-drilling industry as an additive to drilling muds. The coarsely ground mica flakes help prevent loss of circulation by sealing porous sections of the drill hole.

The rubber industry uses ground mica as an inert filler and as a mold release compound in the manufacture of molded rubber products such as tires and roofing. The platy texture acts as an antiblocking, antisticking agent. Rubber mold lubricant accounted for 3.2% of dry-ground mica use in 1996.

The plastics industry uses dry-ground mica as an extender and filler, especially in parts for automobiles for lightweight insulation to suppress sound and vibration. Mica is used in plastic automobile fascia and fenders as a reinforcing material, providing improved mechanical properties, increased strength, stiffness, and dimensional stability. Mica-reinforced plastics also have high-heat dimensional stability, reduced warpage, and the best surface properties of any filled plastic composite. Consumption of dry-ground mica in plastic applications accounted for 3.5% of the market in 1996, slightly lower than the 3.9% in 1995.

Ground mica is used in the production of rolled roofing and asphalt shingles, where it serves as a surface coating to prevent sticking of adjacent surfaces. The coating is not absorbed by freshly manufactured roofing because mica's platy structure is unaffected by the acid in asphalt or by weathering conditions. As a rubber additive, mica reduces gas permeation and improves resiliency.

Other uses include decorative coatings on wallpaper, concrete, stucco, and tile surfaces. It is also used as an ingredient in some special greases, as a flux coating on welding rods, and in foundry applications as coatings for core and mold release compounds, mold washes, and facing agents.

Stocks

Government stocks of mica in the NDS is comprised of stockpile-grade muscovite block, stained and better; muscovite film, first and second quality; muscovite splittings; phlogopite

block; and phlogopite splittings. NDS stocks of muscovite block, muscovite film, and muscovite and phlogopite splittings were available for sale from the Defense National Stockpile Center, Fort Belvoir, VA. Yearend 1996 stocks of various types of mica in the NDS are shown in table 2.

Reported yearend industry stocks of muscovite mica block (ruby and nonruby) decreased from 26.4 tons in 1995 to 21.5 tons in 1996. Industry stocks of muscovite and phlogopite mica splittings decreased from 466 tons at yearend 1995 to 416 tons at yearend 1996. (*See table 6.*)

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 average values of muscovite sheet mica consumed in the United States in 1996 compared with 1995 were as follows: block (ruby and nonruby) increased 5% to \$77 per kilogram and muscovite splittings decreased 4% to \$1.63 per kilogram.

The average value of phlogopite block decreased to \$19.84 per kilogram, while the average value of phlogopite splittings decreased \$0.05 to \$4.40 per kilogram. Changes in average value for block and splitting are more a reflection of the quality of sheet mica consumed during the year than actual changes in prices.

The average U.S. value of crude flake mica, including high-quality sericite, increased to \$81 per ton. The average value for North Carolina flake mica increased to \$80 per ton in 1996.

In 1996, the value of dry-ground mica increased slightly to average \$182 per ton while wet-ground mica also increased to average \$1,032 per ton.

World Review

Following an average year in 1995, the mica market in the United States declined in 1996. Foreign trade was mixed with the value of U.S. exports of mica declining 4.5% to \$14.8 million as the quantity increased 2.6% to 8,371 tons. Imports of mica decreased with the value of U.S. exports of mica, declining 5.1% in value to \$22.6 million and the quantity declining 5.3% to 24,800 tons. (*See table 13.*)

Domestic ground mica imports decreased to 5,830 tons, down 450 tons from the 1995 level. Exports of crude and rifted mica increased, up 97.6% to 1,395 tons. (*See table 8.*) Exports of worked mica sheet in 1996 declined 17.8% to 606 tons. (*See table 9.*) The value of U.S. exports of worked mica sheet decreased to \$10.7 million, 8.9% lower than that in 1995.

The United States continued to rely on imports, primarily from India, for essentially all of its supply of sheet mica and paper-quality scrap mica. Imports for consumption of unmanufactured split block, film, and splittings were about 5,102 tons, 82% more than that in 1995 (*See table 10.*)

About 13,600 tons of ground mica was imported in 1996, mostly from Canada. (*See table 11.*) Worked mica imports

were 5% lower than those in the previous year, at 1,092 tons. (See table 12.)

Outlook

The outlook for mica is for average growth of 3% to 5% based on various economic factors. The major markets for ground mica, joint compounds and paints, are mature and relatively stable, and growth is tied to new housing starts and interest rates. To a lesser extent, widespread natural disasters also effect the market, creating immediate demand for residential building materials. Demand is also responsive to automobile production because interior and exterior parts typically contain dry-ground mica, while exterior surfaces are painted with wet-ground pearlescent pigments and mica-containing coatings.

In 1997 and 1998, domestic demand for crude and ground mica is expected to remain stable. Demand for dry-and wet-ground micas is expected to improve in the short term to meet increasing demand for pearlescent paints and cosmetics. Markets for dry-ground mica are forecast to grow 5%t per year through the year 2000, unless interest rates rise sufficiently to slow demand for new housing and automobiles. Wet-ground mica is also expected to show moderate growth as demand from the cyclical automotive industry utilizes increasing amounts of pearlescent paint pigments.

Demand for block mica is expected to grow slowly through the end of the century as demand increases in a few specialty markets. A shortage of high-quality block mica is expected to continue because of the generally low percentage of high-quality

mica in currently mined deposits (pegmatites).

Consumption of mica splittings, the major type of sheet mica consumed in the United States, decreased sharply throughout the 1960's and 1970's and leveled off in the 1980's and 1990's in the range of 800 to 1,000 tons per year. With no new uses and many substitute materials, no substantial growth is expected. Consumption of mica splittings is expected to remain in the range of 600 to 900 tons.

SOURCES OF INFORMATION

U.S. Geological Survey Publications

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Roskill Information Service Ltd. (London). The Economics of Mica, 7th edition, 1991.

¹Prior to January 1996, published by the U.S. Bureau of Mines

TABLE 1
SALIENT MICA STATISTICS 1/

		1992	1993	1994	1995	1996
United States:						
Production (sold or used by producers):						
Scrap and flake mica	thousand metric tons	85	88	109	108	97
Value	thousands	\$4,640	\$4,450	\$5,780	\$5,630	\$7,820
Ground mica	thousand metric tons	84	92	95	98	103
Value	thousands	\$21,800	\$27,000	\$28,700	\$24,800	\$33,600
Prices, dollars per metric ton:						
Scrap and flake mica		\$55	\$51	\$53	\$52	\$81
Ground:						
Wet		\$745	\$838	\$1,010	\$974 r/	\$1,000
Dry		\$168	\$152	\$151	\$174 r/	\$182
Sheets, dollars per kilogram:						
Block		\$80	\$95	\$66 r/	\$73 r/	\$77
Splittings		\$1.53	\$1.55	\$1.72 r/	\$1.86 r/	\$1.75
Consumption:						
Block, muscovite	metric tons	6	5	6	5	5
Value	thousands	\$447	\$509	\$432	\$407	\$383
Splittings	metric tons	836	826	857	713	859
Value	thousands	\$1,390	\$1,390	\$1,470	\$1,320	\$1,510
Exports	metric tons	5,040	5,860	7,520	8,160	8,380
Imports	do.	18,800	22,200	25,200	26,200	24,700
World: Production	do.	205,000	197,000	238,000	253,000 r/	225,000 e/

e/ Estimated. r/ Revised.

1/ Data are rounded to three significant digits.

TABLE 2
STOCKPILE STATUS AND GOVERNMENT INVENTORIES FOR MICA, DECEMBER 31, 1996 1/

(Metric tons)

Material	Inventory		Available for disposal	1996 sales
	Stockpile grade	Nonstockpile grade		
Block:				
Muscovite, stained and better	1,390	12	1,310	--
Phlogopite	8	--	--	--
Film: Muscovite, 1st and 2d qualities	391	--	96	276
Splittings:				
Muscovite	6,000	--	6,000	234
Phlogopite	307	--	307	226

1/ Data are rounded to three significant digits.

TABLE 3
SCRAP AND FLAKE MICA SOLD OR USED BY PRODUCERS IN THE
UNITED STATES, BY STATE 1/ 2/

(Thousand metric tons and thousand dollars)

State	1995		1996	
	Quantity	Value	Quantity	Value
North Carolina	74	3,690	62	4,900
Other States 3/	34	1,940	35	2,920
Total	108	5,630	97	7,820

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes finely divided mica recovered from mica schist and high-quality sericite schist, and mica that is a byproduct of feldspar, kaolin, and lithium beneficiation.

3/ Includes Georgia, New Mexico, South Carolina, and South Dakota.

TABLE 4
GROUND MICA SOLD OR USED BY PRODUCERS IN THE UNITED STATES,
BY END USE AND METHOD OF GRINDING 1/ 2/

	1995			1996		
	Quantity (thousand metric tons)	Value (thousand dollars)	Unit value	Quantity (thousand metric tons)	Value (thousand dollars)	Unit value
End use:						
Joint cement	45	6,420	\$142	52	8,610	\$165
Paint	19	3,780	198	21	8,850	421
Plastics	4	1,380	344	3	1,970	656
Well-drilling mud	5	582	116	4	815	203
Other 3/	25	12,700	506	23	13,400	581
Total	98	24,800	253	103	33,600	326
Method of grinding:						
Dry	W	W	158	W	W	165
Wet	W	W	884	W	W	936

W Withheld to avoid disclosing company proprietary data.

1/ Data are rounded to three significant digits; may not add to totals shown.

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

3/ Includes mica used for molded electrical insulation, roofing, rubber, textile and decorative coatings, welding rods, and miscellaneous.

TABLE 5
FABRICATION OF MUSCOVITE BLOCK MICA
IN THE UNITED STATES, BY QUALITY 1/

(Metric tons)

Quality	1995	1996
Good stained or better	0.692	0.590
Stained or lower 2/	3.910	4.490
Total	4.600	5.070

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes punch mica.

TABLE 6
CONSUMPTION AND STOCKS OF MICA SPLITTINGS IN
THE UNITED STATES 1/

Year	Consumption		Stocks on
	Quantity (metric tons)	Value (thousands)	Dec. 31 (metric tons)
1995	713	\$1,320	466
1996	859	1,510	416

1/ Data are rounded to three significant digits.

TABLE 7
BUILT-UP MICA SOLD OR USED IN THE UNITED STATES, BY PRODUCT 1/ 2/

	1995		1996	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Flexible (cold)	107	\$566	123	\$1,020
Heater plate	W	W	W	W
Molding plate	181	1,590	179	1,710
Segment plate	172	W	172	1,990
Tape	W	W	W	W
Other	125	943	126	972
Total	614	4,890	633	6,110

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to three significant digits; may not add to totals shown.

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

TABLE 8
U.S. EXPORTS OF CRUDE AND RIFTED MICA, MICA POWDER, AND WASTE IN 1996, BY COUNTRY 1/

Country	Crude and rifted							
	Less than \$0.55 per kilogram		More than \$0.55 per kilogram		Powder		Waste	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Argentina	--	--	--	--	50	\$62	--	--
Australia	19	\$7	1	\$11	121	90	--	--
Barbados	--	--	--	--	7	7	--	--
Belgium	--	--	--	--	14	53	--	--
Brazil	--	--	81	63	11	7	--	--
Canada	31	7	--	--	3,170	1,310	541	\$118
Chile	209	73	--	--	27	20	--	--
Colombia	--	--	--	--	60	41	--	--
Cote d'Ivoire	--	--	--	--	(2/)	9	--	--
France	24	8	--	--	77	127	--	--
Germany	621	183	2	35	15	84	--	--
Hong Kong	36	13	--	--	--	--	--	--
India	--	--	21	45	17	27	--	--
Ireland	15	5	--	--	--	--	--	--
Israel	15	5	--	--	--	--	--	--
Italy	--	--	--	--	51	11	--	--
Jamaica	--	--	--	--	20	22	--	--
Japan	7	3	5	39	431	283	--	--
Korea, Republic of	40	19	1	3	388	312	--	--
Malaysia	--	--	--	--	114	15	--	--
Mexico	--	--	1	9	507	207	--	--
Netherlands	--	--	106	235	--	--	--	--
New Zealand	--	--	--	--	528	143	--	--
Nicaragua	--	--	2	5	--	--	--	--
Norway	--	--	3	66	--	--	--	--
Peru	--	--	--	--	10	9	--	--
Romania	--	--	--	--	8	90	--	--
Singapore	--	--	1	13	--	--	--	--
Spain	10	3	(2/)	5	(2/)	6	--	--
Sweden	8	3	--	--	18	11	--	--
Taiwan	--	--	--	--	59	46	--	--
Thailand	23	8	--	--	--	--	--	--
United Arab Emirates	--	--	--	--	17	12	--	--
United Kingdom	15	5	1	14	1	13	--	--
Uruguay	--	--	--	--	5	8	--	--
Venezuela	99	35	--	--	106	48	--	--
Total	1,170	377	225	542	5,830	3,070	541	118

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Less than 1/2 unit.

Source: Bureau of the Census.

TABLE 9
U.S. EXPORTS OF WORKED MICA IN 1996, BY COUNTRY 1/

Country	Plates, sheets		Other	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Australia	4	\$68	17	\$126
Austria	--	--	(2/)	4
Bahamas, The	12	36	12	49
Barbados	9	100	--	--
Belgium	23	618	(2/)	10
Belize	--	--	(2/)	3
Brazil	11	131	2	118
Canada	107	2,660	59	1,370
Chile	3	19	(2/)	4
China	(2/)	4	(2/)	3
Colombia	3	17	(2/)	11
Costa Rica	13	61	4	18
Dominica	--	--	(2/)	3
Dominican Republic	1	6	(2/)	20
Ecuador	1	3	--	--
El Salvador	2	4	--	--
France	2	76	(2/)	19
Germany	1	10	(2/)	29
Guatemala	4	18	2	9
Honduras	(2/)	3	1	29
Hong Kong	2	61	1	58
India	45	357	18	493
Ireland	--	--	1	19
Italy	26	557	1	14
Jamaica	4	17	4	54
Japan	10	117	50	392
Korea, Republic of	1	7	(2/)	16
Malaysia	--	--	1	20
Mexico	35	785	21	920
Netherlands	--	--	2	32
Netherlands Antilles	1	3	1	7
Pakistan	--	--	(2/)	4
Peru	(2/)	10	--	--
Philippines	--	--	(2/)	3
Russia	--	--	44	248
Saudi Arabia	5	38	(2/)	3
Singapore	4	37	1	14
South Africa	2	38	(2/)	17
Suriname	2	12	--	--
Sweden	(2/)	3	(2/)	9
Switzerland	(2/)	21	6	178
Taiwan	11	168	2	81
United Kingdom	2	65	3	83
Venezuela	4	30	--	--
Total 2/	352	6,170	254	4,490

1/ Data are rounded to three significant digits; may add to totals shown.

2/ Less than 1/2 unit.

Source: Bureau of the Census.

TABLE 10
U.S. IMPORTS FOR CONSUMPTION OF CRUDE AND RIFTED MICA IN 1996, BY COUNTRY 1/

Country	Split block		Splittings		Less than \$0.55 per kilogram		Other More than \$0.55 per kilogram	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	(metric tons)	(thousands)	(metric tons)	(thousands)	(metric tons)	(thousands)	(metric tons)	(thousands)
Canada	--	--	68	\$11	--	--	(2/)	\$2
China	--	--	9	21	--	--	126	266
Finland	--	--	--	--	997	\$299	--	--
France	1	\$6	3	19	--	--	(2/)	2
Germany	--	2	360	73	--	--	--	--
Hong Kong	--	--	--	--	--	--	3	13
India	101	124	4,360	1,640	3,360	654	2	48
Japan	--	--	--	--	--	--	1	17
Korea, Republic of	--	--	--	--	--	--	3	2
Madagascar	--	--	2	9	--	--	--	--
Singapore	--	--	201	30	--	--	--	--
Taiwan	--	--	--	--	--	--	4	15
United Kingdom	--	--	(2/)	2	--	--	(2/)	9
Total	102	132	5,000	1,810	4,360	953	138	375

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Less than 1/2 unit.

Source: Bureau of the Census.

TABLE 11
U.S. IMPORTS FOR CONSUMPTION OF MICA POWDER AND WASTE IN 1996,
BY COUNTRY 1/

Country	Powder		Waste	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Belgium	1	\$1	--	--
Canada	13,000	5,100	(2/)	\$4
China	16	34	--	--
Finland	1	9	--	--
France	3	2	--	--
Germany	41	180	--	--
India	--	--	446	231
Japan	376	2,740	--	--
Korea, Republic of	12	9	--	--
Madagascar	--	--	36	37
Malaysia	35	109	--	--
Mexico	20	2	--	--
Norway	16	11	--	--
United Kingdom	4	58	--	--
Total	13,600	8,250	482	272

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Less than 1/2 unit.

Source: Bureau of the Census.

TABLE 12
U.S. IMPORTS FOR CONSUMPTION OF WORKED MICA IN 1996,
BY COUNTRY 1/

Country	Plates, sheets		Other	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Australia	--	--	1	\$15
Austria	--	--	1	22
Belgium	443	\$4,530	--	--
Brazil	50	652	41	110
Canada	24	284	--	--
China	145	350	24	118
France	32	243	10	105
Germany	8	400	9	479
Hong Kong	--	--	1	8
India	89	700	74	693
Italy	--	--	1	21
Japan	7	72	18	348
Korea, Republic of	8	51	20	44
Russia	--	--	1	3
Singapore	13	290	--	--
Spain	(2/)	5	--	--
Sweden	(2/)	6	--	--
Switzerland	40	848	--	--
Taiwan	(2/)	8	--	--
United Kingdom	21	375	(2/)	7
Venezuela	12	29	--	--
Total	892	8,840	200	1,970

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Less than 1/2 unit.

Source: Bureau of the Census.

TABLE 13
SUMMATION OF U.S. MICA TRADE DATA 1/

	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:								
1995	6,280	\$3,160	952	\$294	198	\$389	737	\$11,700
1996	5,830	3,070	1,710	495	225	542	606	10,700
Imports for consumption:								
1995	14,200	9,280	7,730	1,880	3,080	1,950	1,150	10,700
1996	13,600	8,250	4,840	1,230	5,240	2,310	1,090	10,800

1/ Data are rounded to three significant digits.

Source: Bureau of the Census.

TABLE 14
MICA: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country 3/	1992	1993	1994	1995	1996 e/
Argentina:					
Sheet	373	720	720 e/	700 e/	700
Waste, scrap, etc.	635	1,226	1,104 r/	4,341 r/	4,000
Brazil e/	7,000	7,000	7,000	7,000	7,000
Canada e/	17,500	17,500	17,500	17,500	17,500
France e/	12,000 4/	8,000	8,000	10,000	8,000
India:					
Crude	2,742	2,082	2,055 r/	1,721 r/	2,000
Scrap and waste	1,522	1,187	719 r/	767 r/	750
Total	4,264	3,269	2,774 r/	2,488 r/	2,750
Iran e/ 5/	7,846 4/	8,000	8,000	8,000	8,000
Korea, Republic of (all grades)	7,732	7,500 e/	37,470	43,704	35,923 4/
Madagascar (phlogopite)	798	774 e/	774 e/	432 r/	450
Malaysia	4,754	4,659	4,993	5,848	5,501 4/
Mexico (all grades)	5,866	6,440	5,753	5,028 r/	5,030 4/
Morocco e/	1,500	1,500	1,500	1,500	1,500
Peru e/	100	100	100	100	100
Russia e/	35,000	30,000	25,000	25,000	20,000
Serbia and Montenegro	281	68	158 r/	199 r/	200
South Africa (scrap)	2,079	1,991	1,973	2,137	1,429 4/
Spain e/	200	250	200	200	200
Sri Lanka (scrap) e/	200	200	200	200	200
Taiwan	11,038	9,751	5,220	9,792 r/	9,000
United States (scrap and flake) 6/	85,300	87,900	109,000	108,000	96,600 4/
Zimbabwe	495	500	213 e/	1,040 r/	1,000
Grand total	205,000	197,000	238,000	253,000 r/	225,000

e/ Estimated. r/ Revised.

1/ World data, U.S. data, and estimated data are rounded to three significant digits; may not add to totals shown.

2/ Table includes data available through July 22, 1997.

3/ In addition to the countries listed, China, Norway, Pakistan, Romania, and Sweden are known to produce mica, but available information is inadequate to make reliable estimates of output levels.

4/ Reported figure.

5/ Year beginning Mar. 21 of that stated.

6/ Excludes U.S. production of low-quality sericite and sheet mica, if any.