

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, 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 1994, about 109,000 metric tons of scrap and flake mica was produced in the United States, an increase of 25% from 1993. (See table 1.) Ground mica sales were 95,000 tons valued at \$28.7 million, an increase in tonnage of 2%. Essentially all of the sheet mica used in the United States was imported. Consumption of muscovite block mica increased more than 20% to 6.5 tons, valued at \$432,000. Consumption of mica splittings increased from 826 tons in 1993 to 857 tons in 1994. The value of sheet mica exports increased 33% to \$12.7 million. The value of imports for consumption of sheet mica increased 23% to \$14.6 million. (See table 1.)

Legislation and Government Programs

The calendar year 1994 included the U.S. Government fiscal years for 1994 and 1995. Public Law 103-160, the National Defense Authorization Act for Fiscal Year 1994, was enacted on November 30, 1993, and covered the year 1994 through September 30. It continued specific previous authorizations for disposal of stocks in the National Defense Stockpile (NDS) classified as excess to goal. The National Defense Authorization Act for Fiscal Year 1995, Public Law 103-337, was enacted on October 5, 1994, and covered the last 3 months of 1994. Stocks of mica classified as excess to goal at the end of fiscal year 1994 included 2,018,637 kilograms of muscovite block (stained and better), 465,289 kilograms of muscovite film (1st and 2nd qualities), 6,327,888 kilograms of muscovite splittings, and 583,341 kilograms of phlogopite splittings. Phlogopite block in the stockpile is 84,265 kilograms below the goal of 143,570 kilograms. Yearend NDS data are shown in table 2.

Production

Domestic mine production data for mica are developed by the U.S. Bureau of Mines (USBM) from three separate, voluntary surveys and one mandatory survey. Of the 17 operations to which the *Crude Scrap and Flake Mica* production form was sent, 11 operations, or 65% responded (one operation closed and three were idled), representing 85% of the production shown in table 1. Of the 17 operations to which the *Ground Mica* form was sent, 14 operations, or 82% responded (one operation closed) representing 89% of the domestic ground mica production noted in table 1 (excluding low-grade sericite production). Of the five surveyed operations to which the *Mica Block and Film* consumption form was sent, four operations, or 80% responded, representing 94% of the muscovite block consumption shown in table 1. Of the nine surveyed operations to which the *Mica Splittings* consumption form was sent, nine operations, or 100% responded, representing 100% of the splittings consumption presented in table 1. 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.—Nine domestic companies with 12 mines in 5 States produced scrap and flake mica in 1994. The United States was the world's largest producer with 109,000 tons. North Carolina remained the major producing State, with 62% 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 byproduct 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 Div. of Franklin Industries Inc., Kings Mountain, NC and Velarde, NM; K-T Feldspar Corp., Spruce Pine, NC; The Mineral Mining Co., Kershaw, SC; Pacer Corp., Custer, SD; and Unimin Corp., Spruce Pine, NC.

Ground Mica.—Nine companies operated 12 grinding plants in 5 States. Eight 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 79% of the total of 95.4 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; 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.

United States.—Franklin Industrial Minerals Co. of Nashville, TN, acquired the operations of KMG Minerals Inc., Kings Mountain, NC, making it the largest producer of ground mica in the United States.³ Franklin,

which already had facilities in Velarde, NM, now operates an additional mine and three grinding plants at Kings Mountain, NC. The new company, KMG Minerals, Division of Franklin Industries Inc., had a combined mica production capacity of over 50,000 tons per year. KMG also produced potassium feldspar, kaolin, and silica sand.

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 stems 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 6,500 kilograms, a 20% increase from that of 1993. Stained and lower-than-stained quality remained in greatest demand, accounting for 92% of ruby mica block and 66% of nonruby mica block consumption. The year 1994 was a turnaround from the long-term decline in the use of block mica. 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 3.8% in 1994 to 857 tons. (See table 6.) Muscovite splittings from India accounted for nearly all of domestic consumption. The remainder of consumption was phlogopite splittings imported from Madagascar. The splittings were fabricated into various built-up mica products by nine companies operating nine plants in six 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 246 tons in 1994.

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 reached 198 tons in 1994.

Flexible plate is used in electric motor and generator armatures, field coil insulation, and magnet and commutator core insulation. Mica consumption in flexible plate was 109 tons.

Heater plate is used where high-temperature insulation is required. Consumption in heater plate totaled 21 tons. Tape, powdered mica paper, and silicone and other bonding materials consumed 145 tons.

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.

Total consumption of built-up mica that was consumed or shipped was 719 tons, an increase of 10% from the 1993 level. Segment plate and molding plate were the major end products and accounted for 34.2% and 27.5% 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 1994 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 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 53.5% 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 27.4% of the 1994 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.

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 2% of the market in 1994.

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 made 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 are 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 1994 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 28.8 tons in 1993 to 24.6 tons in 1994. Industry stocks of muscovite and phlogopite mica splittings increased from 427 tons at yearend 1993 to 480 tons at yearend 1994. (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 1994 compared with 1993 were as follows: block (ruby and nonruby) decreased 31% to \$66 per kilogram and splittings increased 3% to \$1.59 per kilogram.

The average value of phlogopite block decreased 11% to \$23 per kilogram, while the average value of phlogopite splittings increased 2% to \$4.45 per kilogram. The changes in average value are more a reflection of the quality of sheet mica consumed during the year than actual changes in prices.

The average value of crude flake mica, including high-quality sericite, was \$66 per ton. The average value for North Carolina flake mica, primarily a flotation product, decreased from \$53 per ton in 1993 to \$47 per ton in 1994.

In 1994, the value of dry ground mica averaged \$151 per ton while wet ground mica averaged \$1,007 per ton.

World Review

The year 1994 was an excellent year for U.S. mica producers and processors. Foreign trade improved with the value of U.S. exports of mica products reaching \$15.9 million, up 30% from

the previous year. The combined value of mica imports also increased, gaining 28% to \$27.1 million. (See table 13.)

Domestic ground mica exports increased to 5,840 tons, up 1,200 tons from the 1993 level. Exports of crude and rifted mica also increased, up 52% to 684 tons. (See table 8.) Exports of worked mica sheet in 1994 gained 21% to 747 tons. (See table 9.) The value of U.S. exports of worked mica sheet was \$12.3 million.

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 block, film, and splittings were about 1,040 tons, 63% less than in 1993. (See table 10.)

About 16,300 tons of ground mica was imported in 1994, mostly from Canada. (See table 11.) Worked mica imports were 8% higher than the previous year, at 1,450 tons. (See table 12.)

World production of mica increased 9% to 241,000 tons, primarily the result of increased production in the United States. Major world producers of ground mica continued to be the United States and Russia, while India continued to be the principal producer of sheet mica. (See table 14.)

India.—Mica mines are operated in the States of Bihar, Andhra Pradesh, and Rajasthan. In Rajasthan, the principal mines are at Banjari, Barla, Bhojpura, Chapi, Galwa, Ganeshpur, Ghegas, Laxmi, and Sidiras. Most mica production in the region is reportedly ruby muscovite, grading stained and lower.¹

United Kingdom.—Microfine Minerals Ltd. of the United Kingdom purchased the mica holdings of L. H. Torkildsen AS of Bergen, Norway, and its Silverit tradename. Microfine purchased the Norwegian company to obtain its market share and planned to produce the Silverit line of wet ground mica products at its existing facilities at Derby. Only three other European countries, Finland, France, and Germany, are presently producing wet ground mica for pearlescent pigments, plastic fillers, and cosmetics.²

Outlook

The outlook for mica is diverse with demand driven by several factors. The major markets for mica, joint compounds and paints, are mature and relatively stable with overall growth tied to new housing starts and interest rates. To a lesser extent, widespread natural disasters affect the market, creating immediate demand for residential materials. Demand is also responsive to automobile production since

interior and exterior parts typically contain dry ground mica, while exterior surfaces are sprayed with wet ground mica pearlescent pigments and mica-containing coatings.

Demand for crude mica is expected to continue to improve in the short-term to meet increasing demand for both dry and wet ground micas. Markets for dry ground mica are forecast to be very good through the year 2000, unless interest rates escalate above yearend 1994 levels. Wet ground mica demand is also expected to show growth as the automotive industry utilizes increasing amounts of pearlescent paint pigments.

Demand for block mica rebounded in 1994 after several years of decline. Domestic markets for block mica are expected to expand slowly through the end of the century, although a shortage of good quality material will continue.

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 to between 900 and 1,000 tons per year. With no new uses, demand for splittings is expected to remain stable, with splittings continuing to be used primarily in electrical parts and bonding formulations. Consumption of mica splittings in the second half of the 1990's is forecast to remain between 800 and 1,000 tons per year.

¹Industrial Minerals (London). Industrial Minerals of Rajasthan. No. 316, Jan. 1994, pp. 44-51.

²———. Norway-Microfine Buys Silverit Mica. No. 324, Sept. 1994, p. 20.

³———. Franklin Acquires KMG Minerals. No. 326, Nov. 1994, p. 14.

TABLE 1
SALIENT MICA STATISTICS 1/

		1990	1991	1992	1993	1994
United States:						
Production (sold or used by producers):						
Scrap and flake mica	thousand metric tons	109	103	85	88	109
Value	thousands	\$5,810	\$5,540	\$4,640	\$4,450	\$7,270
Ground mica	thousand metric tons	97	75	84	92	95
Value	thousands	\$21,600	\$17,300	\$21,800	\$27,000	\$28,700
Prices, dollars per metric ton:						
Scrap and flake mica		\$54	\$54	\$51	\$51	\$56
Ground:						
Wet		\$663	\$640	\$745	\$838	\$1,010
Dry		\$151	\$150	\$168	\$152	\$151
Sheets, dollars per kilogram:						
Block		\$92	\$85	\$80	\$95	\$56
Splittings		\$1.55	\$1.54	\$1.53	\$1.55	\$1.53
Consumption:						
Block, muscovite	metric tons	6	6	6	5	6
Value	thousands	\$554	\$502	\$447	\$509	\$432
Splittings	metric tons	842	854	836	826	857
Value	thousands	\$1,410	\$1,430	\$1,390	\$1,390	\$1,470
Exports	metric tons	5,660	4,900	5,040	5,860	7,520
Imports	do.	15,900 r/	15,700	18,800	22,200	25,200
World: Production	do.	217,000 r/	211,000 r/	206,000 r/	196,000 r/	214,000 e/

e/ Estimated. r/ Revised.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits.

TABLE 2
STOCKPILE STATUS AND GOVERNMENT INVENTORIES FOR MICA, DECEMBER 31, 1994 1/

(Metric tons)

Material	Inventory		Available for disposal	1994 sales
	Stockpile grade	Non stockpile grade		
Block:				
Muscovite, stained and better	2,070	88	1,990	31
Phlogopite	8	52	--	--
Film: Muscovite, 1st and 2nd qualities	465	(2/)	465	41
Splittings:				
Muscovite	6,330	--	6,310	41
Phlogopite	583	--	568	22

1/ Data rounded by the U.S. Bureau of Mines to three significant digits.

2/ Less than 1/2 unit.

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

(Thousand metric tons and thousand dollars)

State	1993		1994	
	Quantity	Value	Quantity	Value
North Carolina	51	2,700	68	3,270
Other States 3/	37	1,760	42	4,000
Total	88	4,450	109	7,270

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines 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/

(Thousand metric tons and thousand dollars)

	1993			1994		
	Quantity	Value	Unit value	Quantity	Value	Unit value
End use:						
Joint cement	49	7,550	\$154 r/	42	8,110	\$193
Paint	16	3,100 r/	194 r/	26	4,790	184
Plastics	4	1,650	412 r/	2	509	255
Well-drilling mud	4	560	140 r/	3	556	185
Other 3/	19	14,100 r/	742 r/	22	14,700	639
Total	92	27,000	293	95	28,700	302
Method of grinding:						
Dry	W	W	152	W	W	W
Wet	W	W	838	W	W	W

r/ Revised. W Withheld to avoid disclosing company proprietary data.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines 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

(Metric tons)

Quality	1993	1994
Good stained or better	674	807
Stained or lower 1/	4,690	5,690
Total	5,360	6,500

1/ Includes punch mica.

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

Year	Consumption		Stocks on Dec. 31 (metric tons)
	Quantity (metric tons)	Value (thousands)	
1993	826	\$1,390	427
1994	857	1,470	480

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

	1993		1994	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Flexible (cold)	104	\$551	109	\$549
Heater plate	W	W	W	W
Molding plate	210	1,720	198	1,520
Segment plate	213	1,380	246	1,620
Tape	W	W	W	W
Other	124	1,070	126	1,200
Total	651	4,720	679	4,890

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

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines 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 1994, BY COUNTRY 1/

Country	Crude and rifted				Powder		Waste	
	Less than \$0.55 per kilogram		More than \$0.55 per kilogram		Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)				
Argentina	--	--	--	--	17	\$8	--	--
Australia	--	--	--	--	485	183	--	--
Bahamas, The	--	--	1	\$18	--	--	--	--
Barbados	--	--	--	--	11	11	--	--
Belgium	--	--	--	--	23	132	--	--
Brazil	--	--	94	66	4	6	--	--
Canada	18	\$8	--	--	2,570	1,050	241	\$52
Chile	--	--	--	--	2	3	--	--
Colombia	32	11	--	--	213	136	--	--
El Salvador	12	4	--	--	--	--	--	--
France	31	11	24	18	274	283	--	--
French Polynesia	--	--	--	--	3	3	--	--
Germany	69	16	--	--	51	46	--	--
Guatemala	--	--	--	--	6	6	--	--
Hong Kong	--	--	--	--	1	5	4	6
India	35	5	48	72	--	--	--	--
Ireland	--	--	--	--	16	3	--	--
Italy	--	--	--	--	121	24	--	--
Jamaica	--	--	18	14	--	--	--	--
Japan	--	--	3	20	509	279	--	--
Korea, Republic of	63	23	9	10	310	227	--	--
Malaysia	--	--	10	7	--	--	--	--
Mexico	60	21	--	--	418	219	--	--
Netherlands	11	4	42	174	3	12	--	--
New Zealand	18	5	--	--	267	68	--	--
Nicaragua	--	--	6	5	--	--	--	--
Pakistan	--	--	--	--	15	14	--	--
Peru	--	--	--	--	14	7	--	--
Philippines	--	--	--	--	31	27	--	--
Singapore	--	--	--	--	117	44	--	--
Spain	--	--	--	--	2	7	--	--
Sweden	--	--	--	--	17	11	--	--
Switzerland	--	--	--	--	7	6	--	--
Taiwan	--	--	--	--	100	50	--	--
Thailand	--	--	--	--	1	15	--	--
United Kingdom	21	7	2	6	111	66	--	--
Uruguay	25	9	--	--	9	9	--	--
Venezuela	32	11	--	--	115	81	--	--
Total	428	136	256	410	5,840	3,040	244	58

1/ Data rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

Source: Bureau of the Census.

TABLE 9
U.S. EXPORTS OF WORKED MICA IN 1994, BY COUNTRY 1/

Country	Plates, sheets		Other	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Argentina	1	\$20	--	--
Aruba	1	6	--	--
Australia	19	142	20	\$80
Bahamas, The	2	9	28	53
Barbados	7	15	--	--
Belgium	27	694	--	--
Belize	1	5	--	--
Bermuda	1	18	--	--
Brazil	22	557	2	78
Canada	138	3,480	57	1,110
Cayman Islands	1	6	2	12
Chile	3	26	(2/)	11
Colombia	13	171	(2/)	5
Costa Rica	2	13	--	--
France	36	339	2	52
Germany	6	110	--	--
Greece	--	--	(2/)	3
Guatemala	(2/)	3	4	15
Haiti	7	10	--	--
Hong Kong	--	--	1	31
Hungary	3	72	2	3
India	2	78	--	--
Italy	23	539	--	--
Japan	12	335	55	97
Korea, Republic of	15	161	2	52
Kuwait	--	--	(2/)	12
Mexico	39	879	129	2,250
Netherlands	--	--	(2/)	9
Netherlands Antilles	--	--	5	16
Nicaragua	--	--	2	4
Nigeria	(2/)	5	--	--
Pakistan	--	--	(2/)	6
Panama	13	31	3	74
Peru	2	90	--	--
Poland	--	--	1	5
Portugal	(2/)	5	--	--
Singapore	1	21	1	18
South Africa, Republic of	1	22	1	4
St. Lucia	--	--	(2/)	3
Suriname	1	10	--	--
Switzerland	2	72	3	90
Taiwan	14	35	2	49
Thailand	1	11	(2/)	3
Turks and Caicos Islands	--	--	1	7
United Kingdom	8	104	1	11
Venezuela	--	--	1	14
Total	422	8,090	325	4,180

1/ Data rounded by the U.S. Bureau of Mines to three significant digits; may not 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 1994, BY COUNTRY

Country	Split block		Splittings		Other			
	Quantity	Value	Quantity	Value	Less than \$0.55 per kilogram		More than \$0.55 per kilogram	
	(metric tons)	(thousands)	(metric tons)	(thousands)	Quantity	Value	Quantity	Value
Canada	--	--	--	--	19	\$4	2	\$15
China	--	--	9	\$21	--	--	71	184
Finland	--	--	--	--	853	270	--	--
France	1	\$11	--	--	--	--	(1/)	4
Germany	--	--	--	--	202	41	--	--
Hong Kong	--	--	--	--	--	--	1	8
India	77	190	935	1,050	4,100	876	19	33
Japan	(1/)	9	--	--	--	--	2	23
Madagascar	1	5	--	--	--	--	--	--
Sri Lanka (Ceylon)	--	--	18	20	--	--	--	--
United Kingdom	(1/)	2	--	--	--	--	--	--
Venezuela	--	--	--	--	--	--	17	159
Total 2/	78	217	962	1,100	5,170	1,190	112	425

1/ Less than 1/2 unit.

2/ Data rounded by the U. S. Bureau of Mines to three significant digits; may not add to totals shown.

Source: Bureau of the Census.

TABLE 11
U.S. IMPORTS FOR CONSUMPTION OF MICA POWDER
AND WASTE IN 1994, BY COUNTRY 1/

Country	Powder		Waste	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Austria	20	\$5	--	--
Canada	15,800	7,190	(2/)	\$4
Finland	17	4	--	--
France	1	11	36	37
Germany	37	150	--	--
India	--	--	1,070	540
Japan	263	3,030	--	--
Korea, Republic of	10	87	--	--
Madagascar	--	--	36	37
Mexico	--	--	13	29
Netherlands	30	17	--	--
Norway	210	140	--	--
Total	16,300	10,600	1,160	647

1/ Data rounded by the U.S. Bureau of Mines 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 1994,
BY COUNTRY 1/

Country	Plates, sheets		Other	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Argentina	--	--	13	\$33
Austria	--	--	1	31
Belgium	668	\$5,720	--	--
Brazil	22	1,080	270	559
Canada	(2/)	8	27	56
China	200	469	--	29
France	27	194	--	--
Germany	7	355	14	212
Hong Kong	1	4	--	--
India	24	427	59	735
Indonesia	2	2	--	--
Ireland	--	--	(2/)	6
Japan	8	99	5	1,110
Korea, Republic of	--	--	23	46
Spain	4	23	--	--
Switzerland	79	1,720	(2/)	2
Taiwan	(2/)	5	1	16
United Kingdom	(2/)	8	--	--
Total	1,040	10,100	415	2,830

1/ Data rounded by the U.S. Bureau of Mines 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

	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)
<u>Exports:</u>								
1993	4,610	\$2,600	335	\$99	292	\$511	617	\$9,020
1994	5,840	3,040	672	194	256	410	747	12,300
<u>Imports for consumption:</u>								
1993	13,100	8,070	4,770	1,310	2,960	2,520	1,350	9,340
1994	16,300	10,600	6,330	1,840	1,150	1,740	1,460	12,900

1/ Previously published and 1994 data are rounded by the U. S. Bureau of Mines to three significant digits.

Source: Bureau of the Census.

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

(Metric tons)

Country ^{3/}	1990	1991	1992	1993	1994 e/
Argentina:					
Sheet	226 r/	610 r/	373 r/	720 r/	720
Waste, scrap, etc.	638 r/	1,040 r/	635 r/	1,230 r/	1,230
Brazil e/	5,000	5,080 4/	7,000 r/	5,000	5,000
Canada e/	16,000	17,000	17,500	17,500	17,500
France e/	7,000	6,000	12,000 4/	8,000	8,000
India:					
Crude	3,860	3,610	3,500 e/	2,080 r/	3,000
Scrap and waste	2,820	1,920	2,000 e/	1,600 e/	1,600
Total	6,680	5,530	5,500 e/	3,680 r/ e/	4,600
Iran 5/	1,350	4,140	7,850	8,000 e/	8,000
Korea, Republic of (all grades)	4,770	5,130	7,730	7,500 e/	7,600
Madagascar (phlogopite)	721	680	798	774 e/	774
Malaysia	3,340	3,520	4,750	4,660	4,990
Mexico (all grades)	5,860	5,590	5,870	6,440 r/	7,060
Morocco e/	1,500	1,500	1,500	1,500	1,500
Peru e/	100	100	100	100	100
Russia e/	XX	XX	35,000	30,000	25,000
Serbia and Montenegro	XX	XX	281 r/	68 r/	75
South Africa, Republic of (scrap)	1,770	1,880	2,080 r/	1,990 r/	1,970
Spain e/	913 4/	300	200 r/	250	200
Sri Lanka (scrap) e/	200	200	200	200	200
Taiwan	4,950	8,600	11,000	9,750 r/	10,000
Tanzania (sheet)	(6/)	(6/)	(6/)	(6/)	(6/)
U.S.S.R. (all grades) e/ 7/	45,000	40,000	XX	XX	XX
United States (scrap and flake) 8/	109,000	103,000	85,300	87,900	109,000
Yugoslavia 9/	802	800	XX	XX	XX
Zimbabwe	1,300	506	495	500	213
Grand total	217,000 r/	211,000 r/	206,000 r/	196,000 r/	214,000

e/ Estimated. r/ Revised. XX Not applicable.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Table includes data available through July 19, 1995.

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/ Data are for Iranian year beginning Mar. 21 of that stated.

6/ Less than 1/2 unit.

7/ Dissolved in Dec. 1991.

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

9/ Dissolved in Apr. 1992.

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