Mica

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The mica group represents 37 phyllosilicate minerals that have a layered or platy texture (Rieder and others, 1998). Phyllo is derived from the Greek word "phyllon," which means leaf. The commercially important micas are muscovite and phlogopite, which are used in a variety of applications. The etymology of mica is the Latin word "micare," meaning to shine or flash.

In 2002, about 81,200 metric tons (t) of scrap and flake mica was produced in the United States; this was 17% less than that of 2001 (tables 1, 3). Ground mica sales totaled 98,000 t, which was an increase of 10% compared with 2001, and were valued at $29.6 million (table 1). Essentially all sheet mica used in the United States was imported; India was the major supplier. Consumption of muscovite block mica decreased to 2.1 t, which was valued at $134,000. Consumption of mica splittings decreased to 573 t in 2002 from 742 t in 2001. Worked and unworked sheet mica exports decreased to 723 t in 2002 from 1,160 t in 2001, and the value decreased to $12.5 million. U.S. imports of worked and unworked sheet mica decreased to 1,580 t in 2002 from 4,290 t in 2001, and the value decreased to $10.2 million.

The value of mica is in 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 transparent to opaque. Mica is stable when exposed to electricity, light, moisture, and extreme temperatures. Based on its greater abundance and superior electrical properties, muscovite is the principal mica used by industry. Phlogopite remains stable at higher temperatures and is used in applications in which a combination of high-heat stability and electrical properties is required. Muscovite and phlogopite are used in sheet and ground forms.

The mica group minerals, which comprise tetrahedral-octahedral-tetrahedral layers, are 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 calcium, magnesium, potassium, and sodium. Layering in the univalent (potassium and sodium) (or true) micas imparts perfect basal cleavage, which allows crystals to be split into very thin sheets that are tough and flexible. Layering in the divalent, or brittle, micas also results in perfect basal cleavage; the greater bond strengths, however, make them more brittle and less flexible.

Legislation and Government Programs

The Floyd D. Spence National Defense Authorization Act for Fiscal Year 2002 (Public Law 107-107), which was enacted on December 28, 2001, reauthorized the transfer of funds from the NDS Transaction Fund for operation and maintenance of the NDS. The revised Annual Materials Plan (AMP) for fiscal year 2002 authorized the disposal of 1,814,369 kg (4,000,000 pounds) of mica (all types) from the National Defense Stockpile (NDS) classified as excess to goal. Stocks of mica classified as excess to goal at the end of fiscal year 2001 (September 30, 2001) were all subject to no disposal limits. Excess fiscal year 2002 NDS mica stocks were 8,433 kg (18,592 pounds) of muscovite block (stained and better), 557 kg (1,229 pounds) of muscovite film (first and second qualities), 3,555,301 kg (7,838,096 pounds) of muscovite splittings, 230,467 kg (508,092 pounds) of phlogopite splittings, and 80 kg (176 pounds) of phlogopite block (table 2).

The Bob Stump National Defense Authorization Act for Fiscal Year 2003 (Public Law 107-314) was enacted into law on December 2, 2002, and reauthorized the transfer of funds from the NDS Transaction Fund for operation and maintenance of the NDS. The revised AMP for fiscal year 2003 authorized the disposal of 22,880 kg (50,441 pounds) of mica (all types) from the NDS classified as excess to goal. Stocks of mica classified as excess to goal at the end of fiscal year 2002 (September 30, 2002) were all subject to no disposal limits. Excess fiscal year 2002 NDS mica stocks were 10,144 kg (22,363 pounds) of muscovite block (stained and better), 506 kg (1,115 pounds) of muscovite film (first and second qualities), and 12,230 kg (26,963 pounds) of phlogopite splittings (table 2).

Production

Domestic mine production data for mica are developed by the U.S. Geological Survey from four separate voluntary surveys. Of the 17 operations to which the "Crude Scrap and Flake Mica Production" form (including sericite production) was sent, 13 operations responded. Of the 14 operations to which the "Ground Mica" form was sent, 12 operations responded (excludes low-grade ground sericite production). Of the six surveyed operations to which the "Mica Block and Film Consumption" form was sent, three operations responded. Of the nine surveyed operations to which the "Mica Splittings Consumption" form was sent, four operations responded. Consumption for the nonrespondents was estimated by using prior-year production data. Individual company production and consumption data are withheld to avoid disclosing company proprietary data.

Georgia Industrial Minerals, Inc. announced the appointment of two distributors for its mica products in the Southeast and Midwest. In the Southeastern United States, Georgia Industrial Minerals selected Azealea Color Co. of Atlanta, GA, to distribute its mica in Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Tennessee. In the Central

United States, Walsh & Associates, St. Louis, MO, was chosen to distribute Georgia Industrial Minerals mica products in the Midwestern States (Georgia Industrial Minerals, Inc., 2002§[1]). The company expanded its Deepstep, GA, operations in 2002 to process 36,000 metric tons per year (t/yr) of mica.

AZCO Mining Inc. raised $3 million in a sale-leaseback transaction of its mica processing property in Glendale, AZ. Under the agreement, AZCO sold 40% of its property and leased it back for an initial period of 10 years with a repurchase option of 120% after the second year. In each succeeding year, the repurchase price will increase by 10% up to a maximum of 150% of the original amount (AZCO Mining Inc., 2002).

Zemex Corporation of Canada announced it had entered into an agreement with Cementos Pacasmayo S.A.A. of Peru for the sale of all its assets, including the mica holdings of Zemex Industrial Minerals, Inc. (ZIM). Pacasmayo purchased Zemex for $8.80 per share, including the assumption of Zemex's current debt. The total purchase cost was about $100 million. The purchase was expected to be completed in 2003 (Zemex Corporation, 2003).

Oglebay Norton Specialty Minerals, Inc. (a subsidiary of Oglebay Norton Company) reported expectations of steady demand for mica. The profitability of the mica group is expected to increase as a result of productivity enhancements and the implementation of cost controls. Income for 2002, however, was not expected to exceed the levels reached in 2001 (Oglebay Norton Company, 2002§).

Scrap and Flake Mica.—In 2002, 9 domestic companies with 10 mines in 5 States produced scrap and flake mica, which excluded low-grade sericite. The United States was one of the world's primary producers with production of 81,200 t (tables 1, 3). North Carolina remained the major producing State with 50% of domestic production, and the remainder was produced in Arizona, Georgia, South Carolina, and South Dakota. Mica was recovered from mica schist, high-quality sericite schist, weathered pegmatites, a gemstone pegmatite, and as a coproduct of feldspar and kaolin mining and processing operations. Stocks of mica at Oglebay Norton's mine near Velarde, NM, were sufficient to supply its mill throughout 2002 without the need for mining. Mining at Velarde was expected to resume in 2003.

The scrap and flake mica producers in 2002 were AZCO, Black Canyon, AZ; Engelhard Corp., Hartwell, GA; The Feldspar Corporation (a ZIM company) (two mines), Spruce Pine, NC; K-T Feldspar Corp., Spruce Pine, NC; Oglebay Norton, Kings Mountain, NC; Georgia Industrial Minerals, Inc., Deepstep, GA; The Mineral Mining Co. Inc., Kershaw, SC; Pacer Corp., Custer, SD; and Unimin Corp., Spruce Pine, NC.

Ground Mica.—In 2002, 10 companies operated 14 grinding plants in 6 States; 10 plants produced dry-ground mica, and 4, wet-ground mica. The four largest ground-mica companies, which included one company with four plants, accounted for 71% of the total of 98,000 t of ground mica produced in the United States (table 4).

Dry-ground mica producers were Asheville Mica Co., Asheville, NC; Georgia Industrial Minerals, Deepstep, GA; AZCO, Glendale, AZ; K-T Feldspar, Spruce Pine, NC; Mineral Mining, Kershaw, SC; Oglebay Norton (two plants), Kings Mountain, NC, and Velarde, NM; Pacer, Custer, SD; Piedmont Minerals Corp., Hillsborough, NC; United States Gypsum Co. (a subsidiary of USG Corp.), Spruce Pine, NC; and Zemex Mica Corp. (a ZIM company), Spruce Pine, NC.

Wet-ground mica producers, in alphabetical order, were AZCO, Glendale, AZ; Engelhard, Hartwell, GA; Oglebay Norton, Kings Mountain, NC; and Zemex Mica, Bakersville, NC.

Sheet Mica.—Small quantities of muscovite sheet and scrap mica were produced as a byproduct by Morefield Gem Mine, Inc. in Amelia County, VA. The pegmatite was mined primarily for gemstones and mineral specimens by using underground methods. The mine also produced biotite and zinnwaldite mica.

Consumption

Statistics on domestic mica consumption are developed by surveying various processors and manufacturers, evaluating import and 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 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, retardation plates in helium-neon lasers, pyrometers, thermal regulators, and stove and kerosene heater windows. Specialized applications for sheet mica are found in aerospace components in ground- and air-launched missile systems, laser devices, medical electronics, optical instrumentation, radar systems, and for radiation treatment.

Only high-quality muscovite film mica, which is variously called India ruby mica or ruby muscovite mica, is used as a dielectric in capacitors. The highest quality 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.

In 2002, consumption of ruby and nonruby muscovite block totaled 2 t; this was a 17% decrease compared with that of 2001 (table 5). Stained and lower-than-stained quality remained in greatest demand and accounted for 79% of consumption of ruby and nonruby mica block. Consumption of nonruby mica block was 79% for stained and lower-than-stained quality and 21% for good quality. The use of block mica was lower because demand decreased.

In 2002, five companies consumed muscovite block and film in five plants in four States—two in North Carolina and one each in New Jersey, Ohio, and Virginia.

In 2002, mica splittings represented the largest part of the sheet mica industry in the United States. Consumption of muscovite and phlogopite splittings decreased by 23% to 573 t in 2002 from 742 t in 2001 (table 6). Muscovite splittings from

[1]References that include a section mark (§) are found in the Internet References Cited section.

India accounted for essentially all domestic consumption. The remainder of consumption was primarily phlogopite splittings imported from Madagascar. Muscovite and phlogopite splittings were fabricated into various built-up mica products by nine companies that operated nine plants in seven States.

Built-Up Mica.—Produced by mechanized 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 bonding materials; flexible, heater, molding, and segment plates; mica paper; and tape (table 7).

Flexible plate (cold) is used in electric motor and generator armatures, field coil insulation, and magnet and commutator core insulation. Mica consumption in flexible plate decreased to 73 t in 2002 from 77 t in 2001 (table 7).

Heater plate is used where high-temperature insulation is required. Consumption of mica in heater plate decreased in 2002 compared with that of 2001.

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 at the end of a commutator. Molding plate is also fabricated into tubes and rings for insulation in transformers, armatures, and motor starters. Consumption of molding plate was essentially unchanged at 194 t in 2002 compared with 195 t in 2001 (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. Although muscovite has a greater resistance to wear, it causes uneven ridges that may interfere with the operation of a motor or generator. Consumption of segment plate was 7 t in 2002 (table 7).

Some types of built-up mica have the bonded splittings reinforced with cloth, glass, linen, muslin, plastic, silk, or special paper. 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.

The total amount of built-up mica that was consumed or shipped was 354 t; this was a decrease of 14% compared with the 411 t in 2001 (table 7). In 2002, flexible plate (cold) and molding plates were the major end products and accounted for 21% and 55% of the total, respectively.

Mica Paper (Reconstituted Mica).—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. In 2002, the manufacturing companies 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 wallboard (drywall) (table 4). The mica acts as a filler and extender, provides a smooth consistency, improves the workability of the compound, and provides resistance to cracking. In 2002, joint compound accounted for 59% 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 aqueous and oleoresinous formulations. Consumption of dry-ground mica in paint, which was its second largest use, accounted for 15% of the 2002 total.

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

The rubber industry uses ground mica as an inert filler and 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 3.7% of the dry-ground mica used in 2002.

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 and 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. In 2002, consumption of dry-ground mica in plastic applications accounted for 5.0% of the market, which was higher than the 3.7% consumed in 2001 (table 4).

Dry-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.

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 as coatings for core and mold release compounds, facing agents, and mold washes in foundry applications.

Wet-ground mica, which retains the brilliancy of its cleavage faces, was used primarily in pearlescent paints by the automotive industry. In the cosmetics industry, its reflective and refractive properties made mica an important ingredient in blushes, eye shadow, foundation, hair and body glitter, and nail polish.

Stocks

Government stocks of mica in the NDS comprised stockpile-grade muscovite block, stained and better; first and second qualities muscovite film; 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 2002 stocks of various types of mica in the NDS are listed in table 2.

Reported yearend industry stocks of muscovite mica block (ruby and nonruby) decreased to 18.6 t in 2002 from 19.0 t in 2001. Industry stocks of muscovite and phlogopite mica

splittings decreased to 417 t at yearend 2002 from 418 t at yearend 2001 (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 2002 compared with the previous year were as follows: muscovite block (ruby and nonruby) increased to $64 per kilogram in 2002 from $52 per kilogram in 2001, muscovite and phlogopite splittings increased to $1.82 per kilogram from $1.67 per kilogram in 2001, and muscovite and phlogopite block (ruby and nonruby) increased in 2002 to $67 per kilogram from $55 per kilogram in 2001 (tables 1, 6).

The average value of phlogopite block increased to $87 per kilogram in 2002 from $79 per kilogram in 2001. The average value of phlogopite splittings was unchanged at $4.91 per kilogram in 2002 when compared with the previous year.

In 2002, the average U.S. value of crude flake mica, which included high-quality sericite, increased to $91 per metric ton (table 3). The average value for North Carolina flake mica decreased to $77 per ton in 2002. The value of dry-ground mica increased by 22% to average $180 per ton, and wet-ground mica increased by 24% to $960 per ton in 2002 (table 1).

Foreign Trade

The quantity of U.S. imports and exports of all types of mica, when totaled for 2002, were essentially unchanged from the 2001 levels. The quantity of U.S. foreign trade for mica varied by less than 1% for both imports and exports. The value of U.S. exports of mica declined by 19% to $17.2 million, while the quantity increased by less than 1% to 10,500 t. The value of U.S. imports of mica decreased by 14% to 22.4 million, while the quantity decreased by less than 1% to 36,400 t. U.S. imports of mica, excluding unworked mica scrap, decreased by 15% in value from 2001 to $20 million while the quantity was essentially unchanged decreasing by less than 1% to 23,200 t.

Domestic ground mica (powder) exports increased to 7,760 t, up by 350 t from that of 2001 (table 8). Exports of crude and rifted mica increased to 745 t; this was up from the 698 t exported in 2001. In 2002, exports of worked mica sheet decreased by 38% to 684 t (based on unrounded data) from 1,110 t in 2001. The value of U.S. exports of worked mica, however, decreased to $12.4 million; this was 25% lower than that of 2001 (table 9).

India continued to supply the United States with essentially all its supply of sheet and paper-quality scrap micas. Imports for consumption of unworked split block, film, splittings, and mica sheet categorized as “Other” totaled about 13,900 t in 2002 (table 10). Imports of unworked low-value scrap mica (less than $1.00 per kilogram), were essentially unchanged from the 2001 level. Demand continued for the low-value mica for use as a dry-ground additive for drywall compound, fillers, and paints.

In 2002, about 20,800 t of ground mica was imported, mostly from Canada (table 11). Worked mica imports were 913 t; this was 17% lower than those of 2001.

Outlook

The outlook for ground mica is for production growth of 1% to 3% per year. The major markets for ground mica—joint compounds and paints—are mature and relatively stable with growth tied to new housing starts and interest rates. To a lesser extent, widespread natural disasters also affect the market by creating immediate demand for residential building materials. Demand is also responsive to automobile production because interior and exterior parts typically contain dry-ground mica and exterior surfaces are painted with wet-ground pearlescent pigments and mica-containing coatings.

In 2003 and 2004, domestic demand for crude and ground mica is expected to remain flat. Demand for wet-ground mica is also expected to see slow growth in the short term because demand for pearlescent automotive coatings has decreased. Demand for the smaller specialty markets for mica in cosmetics, nylon and polyester resins, coated micas, and polypropylene composites are expected to remain strong. Markets for dry-ground mica are forecast to grow by as much as 3% per year through 2005 unless higher interest rates and significantly higher home prices slow demand for new housing and automobiles. Wet-ground mica is expected to show moderate growth in the long term because demand from the cyclical automotive industry should increase with the increased use of pearlescent paint and engineered mica-bearing plastics.

Demand for block mica is expected to grow slowly during the next several years with demand increasing 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, mostly pegmatites.

Consumption of mica splittings, which is the principal type of sheet mica consumed in the United States, decreased sharply throughout the 1960s and 1970s, and leveled off in the 1980s and 1990s in the range of 700 to 1,000 t/yr. With no potential new uses apparent and many substitute materials being used, no substantial growth is expected. Consumption of mica splittings is expected to remain in the range of 500 to 900 t/yr in the 2000s.

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GENERAL SOURCES OF INFORMATION

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TABLE 1
SALIENT MICA STATISTICS[1]

		1998	1999	2000	2001	2002
United States:						
Production, sold or used by producers:						
Scrap and flake mica:						
Quantity	thousand metric tons	87	95	101	98	81
Value	thousands	$7,980	$14,700	$14,800	$7,990	$7,370
Ground mica:						
Quantity	thousand metric tons	104	111	112	89	98
Value	thousands	$31,200	$36,700	$37,500	$28,100	$29,600
Prices:						
Scrap and flake mica	dollars per metric ton	$87	$148	$136	$82	$82
Ground:						
Wet	do.	$909	$849	$751	$771	$960
Dry	do.	$179	$192	$169	$147	$180
Sheets, muscovite and philophite:						
Block	dollars per kilogram	$26	$20	$23	$55	$67
Splittings	do.	$1.67	$1.67	$1.81	$1.67	$1.82
Consumption:						
Block, muscovite:						
Quantity	metric tons	7	7	6	3	2
Value	thousands	$203	$139	$132	$129	$134
Splittings, all types						
Quantity	metric tons	763	786	583	742	573
Value	thousands	$1,270	$1,310	$1,060	$1,240	$1,040
Exports	metric tons	8,900	12,600	11,500	10,500	10,500
Imports	do.	27,400	30,200	34,000	36,600	36,400
World, production	do.	289,000	278,000	328,000	369,000 r	340,000 e

eEstimated. rRevised.
[1]Data are rounded to no more than three significant digits.

TABLE 2
STOCKPILE STATUS AND GOVERNMENT INVENTORIES FOR MICA, DECEMBER 31, 2002[1]

(Metric tons)

	Inventory, uncommitted			
Material	Stockpile grade	Nonstockpile grade	Available for disposal	Fiscal year 2001 sales
Block:				
Muscovite, stained and better	--	--	--	1
Phlogopite	--	--	--	--
Film, muscovite, first and second qualities	--	--	--	--
Splittings:				
Muscovite	3,270	--	3,270	2,410
Phlogopite	119	--	119	218

-- Zero.
[1]Data are rounded to no more than 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)

	2001		2002	
State	Quantity	Value	Quantity	Value
North Carolina	51	3,890	40	3,130
Other[3]	47	4,100	41	4,240
Total	98	7,990	81	7,370

[1]Data are rounded to no more than three significant digits; may not add to total shown.
[2]Includes finely divided mica recovered from mica schist and high-quality sericite schist, and mica that is a byproduct of feldspar and kaolin beneficiation.
[3]Includes Arizona, 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]

	2001			2002		
	Quantity (thousand metric tons)	Value (thousands)	Unit value	Quantity (thousand metric tons)	Value (thousands)	Unit value
End use:						
Joint cement	46	$8,100	$178	58	$10,600	$183
Paint	20	8,030	407	15	3,880	266
Plastics	3	947	290	5	2,270	465
Well-drilling mud	4	422	102	(3)	(3)	209
Other[4]	17	10,600	629	21	12,900	627
Total	89	28,100	314	98	29,400	302
Method of grinding:						
Dry	W	W	147	W	W	180
Wet	W	W	771	W	W	960

W Withheld to avoid disclosing company proprietary data.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Domestic and some imported scrap. Low-quality sericite is not included.
[3]Withheld to avoid disclosing company proprietary data. Data is included in "Other."
[4]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)

	2001	2002
Good stained or better	0.44	0.42
Stained or lower[2]	2.07	1.66
Total	2.51	2.08

[1]Data are rounded to no more than 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 December 31
	Quantity (metric tons)	Value (thousands)	(metric tons)
2001	742	$1,240	418
2002	573	1,040	417

[1]Data are rounded to no more than three significant digits.

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

	2001		2002	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Flexible plate, cold	77	$693	73	$363
Heater plate	W	W	W	W
Molding plate	195	1,700	194	1,510
Segment plate	48	1,780	7	1,000
Tape	W	W	W	W
Other	71	1,150	66	398
Total	411	5,678	354	3,420

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than 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 2002, BY COUNTRY[1]

	Crude and rifted							
	Less than $1 per kilogram		More than $1 per kilogram		Powder		Waste	
Country	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Aruba	--	--	7	$7	--	--	--	--
Australia	--	--	--	--	77	$65	--	--
Bahamas, The	18	$4	--	--	--	--	--	--
Barbados	--	--	--	--	43	36	--	--
Belgium	--	--	--	--	135	69	--	--
Brazil	--	--	--	--	5	3	--	--
Canada	9	3	--	--	4,530	1,430	1,190	$272
Cayman Islands	--	--	(2)	9	--	--	--	--
Chile	--	--	--	--	24	86	--	--
China	--	--	--	--	49	25	--	--
Colombia	--	--	--	--	174	100	--	--
Dominica	--	--	--	--	15	12	--	--
Dominican Republic	--	--	--	--	12	8	--	--
El Salvador	--	--	--	--	37	28	--	--
Finland	--	--	(2)	4	--	--	--	--
France	--	--	1	14	111	107	83	18
Germany	79	35	(2)	3	294	173	--	--
Hong Kong	--	--	--	--	19	15	--	--
India	--	--	29	29	222	93	--	--
Ireland	35	4	--	--	6	12	--	--
Italy	--	--	--	--	59	11	--	--
Japan	173	90	--	--	415	332	--	--
Korea, Republic of	--	--	--	--	208	134	--	--
Malaysia	--	--	--	--	30	11	--	--
Mexico	109	44	(2)	4	472	305	63	26
Netherlands	51	18	--	--	195	305	--	--
Peru	--	--	--	--	(2)	5	--	--
Philippines	--	--	--	--	5	3	--	--
Romania	--	--	1	22	--	--	--	--
Saint Lucia	--	--	--	--	7	6	--	--
Saudi Arabia	--	--	--	--	52	24	--	--
South Africa	--	--	--	--	11	3	--	--
Spain	--	--	--	--	4	3	--	--
Switzerland	--	--	(2)	17	--	--	--	--
Taiwan	--	--	--	--	25	21	--	--
Tanzania	--	--	--	--	2	7	--	--
Thailand	233	174	--	--	--	--	--	--
United Kingdom	--	--	--	--	184	160	--	--
Venezuela	--	--	--	--	338	466	--	--
Total	707	370	38	108	7,760	4,060	1,340	316

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 9
U.S. EXPORTS OF WORKED MICA IN 2002, BY COUNTRY[1]

Country	Plates, sheets		Other	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Australia	2	$42	--	--
Bahamas, The	(2)	10	--	--
Barbados	(2)	5	--	--
Belgium	14	102	--	--
Bermuda	1	3	5	$22
Brazil	54	1,180	--	--
Canada	151	4,150	83	1,760
Chile	(2)	4	--	--
China	(2)	8	--	--
Colombia	8	185	--	--
Ecuador	--	--	(2)	8
France	2	34	1	11
Germany	2	17	--	--
Guatemala	1	13	--	--
Honduras	(2)	8	--	--
Hong Kong	15	117	14	324
India	9	260	4	10
Indonesia	(2)	4	--	--
Ireland	22	51	--	--
Israel	(2)	7	--	--
Italy	39	716	1	28
Jamaica	59	233	--	--
Japan	3	58	9	106
Korea, Republic of	8	127	--	--
Liberia	--	--	(2)	3
Malaysia	--	--	2	10
Mexico	47	594	10	276
Netherlands	2	12	2	45
Pakistan	--	--	(2)	3
Philippines	8	38	--	--
Poland	--	--	(2)	4
Romania	15	320	(2)	--
Russia	13	343	--	--
Singapore	(2)	34	--	--
South Africa	(2)	4	(2)	3
Spain	14	104	(2)	3
Suriname	4	15	--	--
Switzerland	4	52	--	--
Taiwan	27	423	15	188
Thailand	(2)	4	--	--
Trinidad and Tobago	2	50	--	--
United Kingdom	7	108	3	103
Venezuela	1	3	(2)	7
Total	537	9,440	148	2,910

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 10
U.S. IMPORTS FOR CONSUMPTION OF CRUDE AND RIFTED MICA IN 2002, BY COUNTRY[1]

	Split block		Splittings		Other			
					Less than $1 per kilogram		More than $1 per kilogram	
Country	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Canada	(2)	$2	--	--	35	$8	--	--
China	--	--	--	--	3,140	342	3	$75
Finland	--	--	--	--	1,700	336	--	--
Germany	--	--	113	$32	--	--	--	--
Hong Kong	--	--	--	--	--	--	1	11
India	106	95	438	203	8,330	1,700	(2)	12
Japan	--	--	--	--	--	--	9	11
Total	106	97	551	235	13,200	2,390	13	107

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 11
U.S. IMPORTS FOR CONSUMPTION OF MICA POWDER AND WASTE IN 2002, BY COUNTRY[1]

	Powder		Waste	
Country	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Argentina	773	$1,030	--	--
Brazil	--	--	102	$45
Canada	16,700	5,960	25	70
China	2,840	472	(2)	8
France	(2)	3	--	--
Germany	26	63	--	--
India	72	40	736	350
Japan	373	1,690	--	--
Malaysa	12	25	--	--
Mexico	(2)	8	--	--
Russia	10	12	--	--
Singapore	--	--	17	6
United Kingdom	1	7	--	--
Total	20,800	9,310	880	479

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Less than 1/2 unit.

Source: U.S Census Bureau.

TABLE 12
U.S. IMPORTS FOR CONSUMPTION OF WORKED MICA IN 2002 BY COUNTRY[1]

Country	Plates, sheets		Other	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Austria	55	$1,150	21	$420
Belgium	328	3,840	1	11
Brazil	10	43	--	--
Canada	43	300	2	17
China	136	320	55	335
Costa Rica	(2)	3	--	--
Denmark	36	82	--	--
France	28	188	1	25
Germany	(2)	14	2	48
Hong Kong	--	--	6	57
India	23	535	24	468
Ireland	(2)	9	--	--
Japan	10	196	12	196
Korea, Republic of	14	86	25	36
Mexico	--	--	(2)	3
Spain	--	--	4	48
Switzerland	57	897	--	--
United Kingdom	7	133	10	278
Vietnam	--	--	4	9
Total	747	7,800	166	1,950

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Less than 1/2 unit.

Source: U.S. Census Bureau.

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:								
2001	7,410	$3,900	1,890 r	$701 r	55 r	$160 r	1,110	$16,600
2002	7,760	4,060	2,050	686	38	108	685	12,400
Imports for consumption:								
2001	17,700	9,370	14,600 r	2,910 r	3,190 r, 2	1,710 2	1,100	11,900
2002	20,800	9,310	14,100	2,860	670 2	439 2	913	9,750

rRevised.
[1]Data are rounded to no more than three significant digits.
[2]Excludes unworked sheet mica valued at less than $1 per kilogram.

Source: U.S. Census Bureau.

TABLE 14
MICA: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country[3]	1998	1999	2000	2001	2002[e]
Argentina, all grades	3,480	3,097	3,100 [e]	2,772 [r]	2,357 [p]
Brazil	4,000	3,000	5,000 [r]	5,000 [r]	5,000
Canada[e]	17,500	17,500	17,500	17,500	17,500
France[e]	10,000	10,000	10,000	10,000	10,000
India:					
Crude	1,489	1,500 [e]	1,500 [e]	1,300	1,500
Scrap and waste	966	1,000 [e]	950 [e]	1,100	2,000
Total	2,455	2,500 [e]	2,450 [e]	2,400	3,500
Iran[4]	1,084	1,425	2,000 [e]	2,000	2,000
Korea, Republic of, all grades	38,459	24,733	65,249	109,339 [r]	100,000
Madagascar, phlogopite	1,232	54	66	90 [r]	45
Malaysia	3,642	3,675	3,835	4,107 [r, 5]	4,200
Mexico, all grades	890	971	1,658 [r]	648 [r]	700
Morocco	600 [e]	210	1,897	-- [r, e]	--
Norway, flake[e]	2,500	2,500	2,500	2,500	2,600
Russia[e]	100,000	100,000	100,000	100,000	100,000
Serbia and Montenegro[e]	150	50	100	100	100
South Africa, ground and scrap	1,558 [r]	1,010	676 [r]	950 [r]	383
Spain[e]	2,500	2,500	2,500	2,500	2,500
Sri Lanka, scrap	2,800	1,425	1,491	1,161 [r]	1,100
Taiwan	7,750	6,966	6,862	9,733	6,595 [5]
United States, scrap and flake[6]	87,000	95,400	101,000	97,800	81,100 [5]
Zimbabwe	1,309	1,300 [e]	-- [r]	-- [r]	--
Grand total	289,000	278,000	328,000	369,000 [r]	340,000

[e]Estimated. [p]Preliminary. [r]Revised. -- Zero.

[1]World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Table includes data available through May 30, 2003.

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

[4]Year beginning March 21 of that stated.

[5]Reported figure.

[6]Excludes U.S. production of low-quality sercite and sheet mica if any.