MICA

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The mica group currently represents 37 phyllosilicate minerals that have a layered or platy texture (Rieder and others, 1998). (Phyllo is derived from the Greek word *phyllon*, meaning leaf.) The commercially important micas are muscovite and phlogopite.

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 flexible, elastic, platy, transparent to opaque, resilient, reflective, refractive, dielectric, chemically inert, insulating, lightweight, and hydrophilic. Mica also 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 where a combination of high-heat stability and electrical properties is required. Muscovite and phlogopite are used in sheet and ground forms.

In 2000, about 101,000 metric tons (t) of scrap and flake mica was produced in the United States, 6% more than that of 1999 (tables 1, 3). Ground mica sales were 112,000 t, a slight increase in tonnage of 1% compared with 1999, and were valued at $37.5 million. Essentially all sheet mica used in the United States was imported, and India was the major supplier. Consumption of muscovite block mica decreased to 5.9 t valued at $132,000. Consumption of mica splittings decreased to 583 t in 2000 from 786 t in 1999. Worked and unworked sheet mica exports decreased to 1,280 t in 2000 from 1,290 t in 1999, and the value decreased by 7% to $17.4 million. U.S. imports of worked and unworked sheet mica increased to 5,710 t in 2000 from 4,550 t in 1999, and the value decreased by 2% to $14.1 million.

Legislation and Government Programs

The National Defense Authorization Act for Fiscal Year 2000 (Public Law 106-65), which was enacted on October 5, 1999, did not change the previous authorization for the disposal of stocks of mica in excess of the National Defense Stockpile (NDS) goals. Stocks of mica classified as excess to goal at the end of fiscal year 1999 (September 30, 1999) were all subject to either no disposal limits or were below the disposal limits previously specified. Excess NDS mica stocks were 283,322 kilograms (kg) (624,619 pounds) of muscovite block (stained and better), 702 kg (1,548 pounds) of muscovite film (1st and 2nd qualities), 5,232,975 kg (11,536,734 pounds) of muscovite splittings, 234,345 kg (516,643 pounds) of phlogopite splittings, and 53,498 kg (117,942 pounds) of phlogopite block. The law authorized the transfer of no more than $150 million from the NDS Transaction Fund to the operation and maintenance accounts (no more than $50 million each) of the Army, Navy, and Air Force (section 304). The law also obligated no more than $78.7 million of the NDS Transaction Fund for the operation of the NDS program, including disposal of hazardous materials that are environmentally sensitive.

The Floyd D. Spence National Defense Authorization Act for

Mica in the 20th Century

In 1900, mica production was at an all-time high owing to increased use of small-sized mica, which was previously considered a waste product. Much of this small-sized material was recovered from scrap heaps at existing mine sites to complement the shop scrap used to meet the flourishing demand from the electric industry. At the turn of the 20th century, sheet mica was used primarily in stove windows, chimneys and lampshades on open-flame gas and oil lights, and furnace peephole covers. Most of these uses of large-sized mica sheet were in decline with the advent of the domestic electric industry. The demand for small-sized material for use as insulators in electric motors, coil insulators in magnetos in early gasoline engines, insulators in spark plugs, and in nonelectric phonographs, which had a stylus set in a mica diaphragm, was increasing. Other sheet mica uses were as windows in horse-drawn buggies and in boiler gauges. Wet-ground mica was used in turn-of-the-century wallpaper, and coarsely ground material was used as an artificial snow during the winter holidays. The primary use of dry-ground mica was in the rolled roofing and asphalt industry where it was used to prevent sticking. Dry-ground mica was also used as an additive in axle grease and special lubricants and in quack medicines and elixirs. In the early days of electric power generation, sheet mica was the only material available with electrical and mechanical properties suitable to operate at the temperatures necessary for the efficient functioning of the electrical equipment. In 1900, U.S. production of sheet mica was 207 metric tons valued at $92,758.

In 2000, U.S. production of sheet mica was negligible. Imports of sheet mica were 5,710 tons valued at $14.1 million. Sheet mica was used primarily in electric motors, with lesser amounts used as spacers and washers in electronics and as insulation in toasters, electric hair dryers, and hair curling irons. Sheet mica was also used in stove windows, lamp shades, and in turn-of-the-century reproduction wallpaper. Ground mica production in 2000 was 112,000 tons valued at $37.5 million. Major uses of dry-ground mica were in house paints and in joint compound for drywall. Wet-ground mica was used in pearlescent paints for automobile coatings, to add sparkle and shimmer in cosmetics, in plastic reinforcement fillers, in nylon and polyester resins, and in polypropylene composites.

Fiscal Year 2001 (Public Law 106-398), which was enacted on October 30, 2000, continued the funding of $150 million ($50 million each) of the operation and maintenance accounts of the Army, Navy, and Air Force by the NDS Transaction Fund. The law obligated no more than $71 million of the NDS Transaction Fund for the operation of the NDS program, including disposal of hazardous materials that are environmentally sensitive, a decrease of $7.7 million from that of 1999. The revised Annual Material Plan for fiscal year 2000 authorized the disposal of 1,025,119 kg (2,260,000 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 2000 (September 30, 2000) were all subject to either no disposal limits or were below the disposal limits previously specified. Excess NDS mica stocks were 51,836 kg (114,279 pounds) of muscovite block (stained and better), 674 kg (1,485 pounds) of muscovite film (1st and 2nd qualities), 4,168,229 kg (9,189,371 pounds) of muscovite splittings, 232,554 kg (512,693 pounds) of phlogopite splittings, and 15,902 kg (35,058 pounds) of phlogopite block (table 2).

Production

Domestic mine production data for mica are developed by the U.S. Geological Survey from four separate voluntary surveys. Of the 14 operations to which the "Crude Scrap and Flake Mica" production form (including sericite production) was sent, 9 operations responded. Of the 16 operations to which the "Ground Mica" form was sent, 6 operations responded and 1 had not started grinding (excludes low-grade ground sericite production). Of the five surveyed operations to which the "Mica Block and Film" consumption form was sent, four operations responded. Of the nine surveyed operations to which the "Mica Splittings" consumption form was sent, seven 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.

AZCO Mining Inc. reported that it had completed a production run at the end of 1999 at its mica mine at Black Canyon, AZ. The mine produced an initial run of 7,000 t of high-grade green-colored muscovite. The stockpile of ore from the Black Canyon Mica Mine was expected to be sufficient to supply AZCO's Glendale processing plant at Glendale, AZ, with feed for a full year. The mine, which is on Federal land, was expected to produce muscovite from a swarm of pegmatite dikes that occur over a distance of 1,524 meters (m) with widths varying from 3 to 18 m (AZCO Mining Inc., 2000b).

AZCO Mining Inc. announced that its subsidiary, Azco Mica Inc. of Glendale, AZ, began production of a wet-ground cosmetic grade mica. The mica is a pearl-white muscovite mica with high luster and translucence that is available in two particle ranges, 1 to 50 microns and 5 to 70 microns. The company also has the capability to produce high aspect ratio mica that is used in plastics and pearlescent paints (AZCO Mining Inc, 2000a).

Zemex Industrial Minerals Inc. (ZIM), a subsidiary of Zemex Corp., announced that its phlogopite operations in Canada had a very strong year. This fact, however, was offset by the fact that ZIM had to put its Spruce Pine, NC, mica operation, which it purchased from Aspect Minerals, Inc. in 1998, on a care and maintenance basis because of decreased availability of byproduct feed material. Feed for the plant had relied more heavily on mined byproduct; however, inconsistencies in the grade and quality of the ores in conjunction with increased processing costs resulted in the decision to idle the facility (Zemex Corp., 2001).

Oglebay Norton Specialty Minerals, Inc. (ONSM), a subsidiary of Oglebay Norton Co., produced dry- and wet-ground mica from its mining and processing operations near Kings Mountain, NC, and Velarde, NM. ONSM, which acquired Franklin Industries' mica business in 1999, increased its earnings because demand was strong for mica products in 2000 (Oglebay Norton Co., 2001).

Scrap and Flake Mica.—In 2000, 8 domestic companies with 11 mines in 6 States produced scrap and flake mica (excluding low-grade sericite). The United States was one of the world's primary producers with 101,000 t (tables 1, 3). North Carolina remained the major producing State, with 46% of domestic production, and the remainder was produced in Georgia, New Mexico, South Carolina, South Dakota, and Virginia. Mica was recovered from mica schist, high-quality sericite schist, weathered pegmatites, a gemstone pegmatite, and as a coproduct of feldspar and kaolin.

The scrap and flake mica producers, in alphabetical order, were AZCO Mining Inc., Black Canyon, AZ (contract basis); Engelhard Corp., Hartwell, GA; The Feldspar Corp., a Zemex Industrial Minerals company, (2 mines) Spruce Pine, NC; K-T Feldspar Corp., Spruce Pine, NC; Oglebay Norton Specialty Minerals, Inc., Kings Mountain, NC, and Velarde, NM; The Mineral Mining Co. Inc., Kershaw, SC; Pacer Corp., Custer, SD; Tinton Enterprises, Spearfish, SD; Unimin Corp., Spruce Pine, NC; and Zemex Mica Corp., a Zemex Industrial Minerals company, Micaville, NC.

Ground Mica.—In 2000, 11 companies operated 16 grinding plants in 6 States; 11 plants produced dry-ground mica, and 5, wet-ground mica. The four largest ground mica companies, including one company with four plants, accounted for 64% of the total of 112,000 t (table 4).

Dry-ground mica producers, in alphabetical order, were Asheville Mica Co., Asheville, NC; Georgia Industrial Minerals, Inc., Deep Step, GA; AZCO Mining Inc., Glendale, AZ; The Mineral Mining Co. Inc., Kershaw, SC; Oglebay Norton Specialty Minerals Inc. (2 plants), Kings Mountain, NC, and Velarde, NM; Pacer Corp., Custer, SD; Piedmont Minerals Corp., Hillsborough, NC; USG Corp., Spruce Pine, NC; and Zemex Mica Corp., a Zemex Industrial Minerals company, Spruce Pine, NC.

Wet-ground mica producers, in alphabetical order, were AZCO Mining Inc., Glendale, AZ; Engelhard Corp., Hartwell, GA; Oglebay Norton Specialty Minerals Inc., Kings Mountain, NC; and Zemex Mica Corp., a Zemex Industrial Minerals company, Bakersville, NC.

Sheet Mica.—Small quantities of muscovite sheet and scrap mica were produced as a byproduct by Morefield Gem Mine, Inc., in Amelia Co., VA. The pegmatite was mined primarily for gemstones and mineral samples 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-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 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 aerospace components in ground- and air-launched missile systems, optical instrumentation, laser devices, medical electronics for radiation treatment, and radar systems.

Only high-quality muscovite film mica is used as a dielectric in capacitors. The highest quality film is used to manufacture capacitors for calibration standards. The next grade down is used in transmitting capacitors. Receiving capacitors use a slightly lower grade of high-quality muscovite.

In 2000, consumption of muscovite block (ruby and nonruby) totaled 5,940 kg, a 10% decrease compared with that of 1999 (table 5). Stained and lower than stained quality remained in greatest demand, accounting for 96.1% of ruby mica block. Consumption of nonruby mica block was split—88% for stained quality and 12% for good quality. The use of block mica was lower as demand in electronic and nonelectronic applications decreased.

In 2000, 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. In 2000, mica splittings represented the largest part of the sheet mica industry in the United States. Consumption of muscovite and phlogopite splittings decreased by 26% to 583 t (table 6). Muscovite splittings from India accounted for essentially all of the 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 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 bonding materials, flexible plate, heater plate, mica paper, molding plate, segment plate, and tape (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 10 t in 2000 (table 7).

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 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 increased by 11% to 194 t in 2000 from 175 t in 1999 (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 61 t in 2000 from 125 t in 1999 (table 7).

Heater plate is used where high-temperature insulation is required. Consumption of mica in heater plate increased by 1% in 2000 compared with that of 1999.

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 358 t, a decrease of 32.7% compared with that of 1999 (table 7). In 2000, molding plate and flexible plate (cold) were the major end products and accounted for 54% and 17% 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 1999, manufacturing companies, in alphabetical order, 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 2000, joint compound accounted for 44% 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, its second largest use, accounted for 30% of the 2000 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 4.8% of dry-ground mica use in 2000.

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. In 2000, consumption of dry-ground mica in plastic applications accounted for 4.4% of the market, higher than the 2.9% consumed in 1999 (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 also used in 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.

Wet-ground mica, which retains the brilliancy of its cleavage faces, was used primarily in pearlescent paints by the automotive industry. Its reflective and refractive properties were also used in cosmetics where it was used as an ingredient in eye shadow, body and hair glitter, face makeup, and fingernail polish.

Stocks

Government stocks of mica in the NDS comprised stockpile-grade muscovite block, stained and better; muscovite film, 1st and 2nd qualities 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 2000 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 17.8 t in 2000 from 19.3 t in 1999. Industry stocks of muscovite and phlogopite mica splittings decreased to 404 t at yearend 2000 from 411 t at yearend 1999 (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 2000 compared with the previous year were as follows: block (ruby and nonruby) increased to $22 per kilogram from $21 per kilogram in 1999, and muscovite splittings increased to $1.60 per kilogram from $1.51 per kilogram in 1999.

The average value of phlogopite block increased to $14.95 per kilogram in 2000 from $12.82 per kilogram in 1999. The average value of phlogopite splittings increased to $4.89 per kilogram in 2000 from $4.69 per kilogram in 1999.

In 2000, the average U.S. value of crude flake mica, including high-quality sericite, increased to $136 per ton (table 1). The average value for North Carolina flake mica decreased to $98 per ton in 2000. The value of dry-ground mica decreased 12% to average $169 per ton, and wet-ground mica also decreased 12% to average $751 per ton (table 1).

Foreign Trade

Demand for mica increased in U.S. and foreign markets in 2000. Foreign trade decreased, with the value of U.S. exports of mica decreasing by 9% to $22.4 million as the quantity decreased by 8% to 11,500 t. Imports of mica, however, increased by 12% to 34,000 t with the value of U.S. imports of mica increasing by 5% to $28.1 million (table 13).

Domestic ground mica exports increased to 8,880 t, up 1,560 t from that of 1999 (table 8). Exports of crude and rifted mica decreased to 651 t, primarily the result of decreased sheet mica sales from the NDS. Exports of worked mica sheet in 2000 increased by 27% to 1,070 t (table 9). The value of U.S. exports of worked mica sheet increased to $17.1 million, 2.8% higher than that of 1999.

India continued to supply the United States with essentially all of its supply of sheet and paper-quality scrap mica. Imports for consumption of unworked split block, film, splittings, and mica sheet catagorized as "Other," were about 9,784 t, 37% higher than that of 1999 (table 10).

About 22,100 t of ground mica were imported in 2000, mostly from Canada (table 11). Worked mica imports were 1,310 t, 27% lower than those of 1999 (table 12).

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, and growth is tied to new housing starts and interest rates. To a lesser extent, widespread natural disasters also affect 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, and exterior surfaces are painted with wet-ground pearlescent pigments and mica-containing coatings.

In 2001 and 2002, domestic demand for crude and ground mica is expected to increase slightly. Demand for wet-ground mica is expected to improve significantly, at up to twice the rate of dry-ground mica, in the short term to meet increasing demand for plastic reinforcement fillers, nylon and polyester resins, polypropylene composites, pearlescent paints, and cosmetics. Markets for dry-ground mica are forecast to grow by as much as 3% per year through the year 2005, unless interest rates and prices rise sufficiently to slow demand for new housing and automobiles. Wet-ground mica is expected to show moderate growth in the long term as demand from the cyclical automotive industry, which uses increasing amounts of pearlescent paint and engineered mica-bearing plastics, increases.

Demand for block mica is expected to grow slowly over the next several years 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 (2000) mined deposits (pegmatites).

Consumption of mica splittings, 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 per year (t/yr). 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 500 to 900 t/yr.

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TABLE 1
SALIENT MICA STATISTICS 1/

		1996	1997	1998	1999	2000
United States:						
Production (sold or used by producers):						
Scrap and flake mica	thousand metric tons	95 r/	112 r/	87	95 r/	101
Value	thousands	$8,400 r/	$9,880 r/	$7,980 r/	$14,700 r/	$14,800
Ground mica	thousand metric tons	103	110	104	111	112
Value	thousands	$33,600	$37,000	$31,200	$36,700	$37,500
Prices, dollars per metric ton:						
Scrap and flake mica		$81	$83	$87	$148 r/	$136
Ground:						
Wet		$1,030	$1,080	$909	$849	$751
Dry		$182	$176	$179	$192	$169
Sheets, dollars per kilogram, muscovite and phlogopite:						
Block		$55	$28	$26	$20	$23
Splittings		$1.75	$1.69	$1.67	$1.67	$1.81
Consumption:						
Block, muscovite	metric tons	6	8	7	7	6
Value	thousands	$383	$249	$203	$139	$132
Splittings, all types	metric tons	859	736	763	786	583
Value	thousands	$1,510	$1,240	$1,270	$1,310	$1,060
Exports	metric tons	8,380	9,210	8,900	12,600	11,500
Imports	do.	24,700	28,900	27,400	30,200	34,000
World, production	do.	297,000 r/	308,000 r/	285,000 r/	279,000 r/	290,000 e/

e/ Estimated. r/ Revised.
1/ Data are rounded to no more than three significant digits.

TABLE 2
STOCKPILE STATUS AND GOVERNMENT INVENTORIES FOR MICA, DECEMBER 31, 2000 1/

(Metric tons)

	Inventory (uncommitted)			
Material	Stockpile grade	Nonstockpile grade	Available for disposal	Fiscal year 1999 sales
Block:				
Muscovite, stained and better	171	--	171	132
Phlogopite	4	--	4	2
Film, muscovite (1st and 2d qualities)	--	--	--	--
Splittings:				
Muscovite	1,050	--	1,050	1,070
Phlogopite	233	--	233	--

-- 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)

	1999		2000	
State	Quantity	Value	Quantity	Value
North Carolina	47	$4,550	47	$4,550
Other States 3/	49 r/	10,100 r/	54	10,200
Total	95 r/	14,700 r/	101	14,800

r/ Revised.
1/ Data are rounded to no more than 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, South Dakota, and Virginia.

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

	1999			2000		
	Quantity (thousand metric tons)	Value (thousands)	Unit value	Quantity (thousand metric tons)	Value (thousands)	Unit value
End use:						
Joint cement	50	$9,760	$194	50	$8,670	$186
Paint	33	10,700	324	33	11,100	334
Plastics	3	1,460	450	5	2,140	436
Well-drilling mud	5	926	189	6	1,110	180
Other 3/	20	13,900	693	18	14,500	786
Total	111	36,700	329	112	37,500	333
Method of grinding:						
Dry	W	W	192	W	W	169
Wet	W	W	849	W	W	751

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/ 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)

	1999	2000
Good stained or better	0.394	0.323
Stained or lower 2/	6.230	5.620
Total	6.620	5.940

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/

	Consumption		Stocks on
Year	Quantity (metric tons)	Value (thousands)	December 31 (metric tons)
1999	786	$1,310	411
2000	583	1,060	404

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/

	1999		2000	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Flexible plate (cold)	125	$875	61	$363
Heater plate	W	W	W	W
Molding plate	175	1,630	194	1,560
Segment plate	50	1,810	10	1,040
Tape	W	W	W	W
Other	157	1,890	72	508
Total	532	6,620	358	3,670

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 2000, BY COUNTRY 1/

Country	Crude and rifted: Less than one dollar per kilogram, Quantity (metric tons)	Crude and rifted: Less than one dollar per kilogram, Value (thousands)	Crude and rifted: More than one dollar per kilogram, Quantity (metric tons)	Crude and rifted: More than one dollar per kilogram, Value (thousands)	Powder, Quantity (metric tons)	Powder, Value (thousands)	Waste, Quantity (metric tons)	Waste, Value (thousands)
Argentina	--	--	--	--	78	$50	--	--
Australia	--	--	--	--	49	27	--	--
Barbados	--	--	--	--	35	30	--	--
Belgium	26	$9	--	--	45	24	--	--
Brazil	16	6	--	--	32	69	--	--
Canada	13	4	--	--	5,030	1,720	859	$202
China	--	--	--	--	23	36	--	--
Colombia	--	--	11	$10	39	33	--	--
Congo (Brazzaville)	--	--	--	--	33	24	--	--
Costa Rica	25	9	--	--	--	--	--	--
Cote d'Ivoire	--	--	--	--	(2/)	7	--	--
Dominica	--	--	--	--	7	6	--	--
Dominican Republic	--	--	--	--	9	8	--	--
Ecuador	--	--	--	--	6	4	--	--
France	16	6	--	--	82	104	41	9
Germany	12	8	98	78	79	37	--	--
Guatemala	--	--	2	10	--	--	--	--
Hong Kong	12	4	--	--	48	29	--	--
Hungary	--	--	--	--	4	3	--	--
India	--	--	2	20	240	230	--	--
Indonesia	--	--	--	--	21	11	--	--
Ireland	34	4	--	--	42	21	--	--
Israel	--	--	--	--	78	26	--	--
Italy	--	--	--	--	652	383	--	--
Japan	--	--	71	85	337	303	--	--
Korea, Republic of	20	8	--	--	275	259	--	--
Malaysia	--	--	--	--	191	74	--	--
Mexico	24	8	1	7	632	495	--	--
Netherlands	--	--	--	--	184	132	39	21
New Zealand	--	--	(2/)	5	73	55	--	--
Niue	--	--	--	--	11	7	--	--
Pakistan	--	--	--	--	11	12	--	--
Qatar	--	--	9	79	--	--	--	--
Russia	--	--	--	--	19	5	--	--
Saudi Arabia	--	--	--	--	34	16	--	--
Singapore	52	18	--	--	--	--	--	--
South Africa	--	--	--	--	17	4	--	--
Spain	--	--	--	--	1	8	--	--
St. Lucia	--	--	--	--	4	3	--	--
Switzerland	--	--	11	7	--	--	--	--
Taiwan	--	--	--	--	146	112	--	--
Tanzania	--	--	--	--	3	7	--	--
Thailand	--	--	--	--	29	17	--	--
Trinidad and Tobago	--	--	--	--	4	8	--	--
United Kingdom	194	71	3	35	224	169	--	--
Venezuela	--	--	(2/)	7	45	36	--	--
Total	442	151	209	343	8,880	4,610	939	232

-- 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 2000, BY COUNTRY 1/

Country	Plates, sheets		Other	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Argentina	25	$124	--	--
Australia	29	788	--	--
Bahamas, The	1	15	1	$16
Bahrain	1	23	--	--
Bangladesh	(2/)	4	--	--
Barbados	8	49	2	24
Belgium	9	231	--	--
Brazil	60	1,160	6	180
Canada	124	3,290	85	1,890
Chile	72	216	--	--
China	3	40	--	--
Colombia	13	245	--	--
Costa Rica	1	10	2	27
Denmark	(2/)	3	--	--
Dominican Republic	1	4	--	--
El Salvador	2	6	--	--
France	10	147	14	91
Gambia, The	(2/)	8	--	--
Germany	29	265	(2/)	23
Guatemala	1	3	--	--
Guyana	(2/)	5	--	--
Honduras	(2/)	5	--	--
Hong Kong	6	48	(2/)	6
India	21	416	(2/)	3
Indoneisa	(2/)	4	--	--
Ireland	2	20	--	--
Israel	6	61	1	27
Italy	22	444	1	22
Jamaica	15	109	--	--
Japan	3	94	1	51
Korea, Republic of	3	28	1	21
Mexico	159	1,610	74	2,290
Netherlands	1	12	--	--
Netherlands Antilles	(2/)	8	1	8
Peru	61	437	--	--
Qatar	5	15	--	--
Saudi Arabia	1	10	--	--
Singapore	21	110	--	--
South Africa	(2/)	28	--	--
Spain	(2/)	3	(2/)	9
Sweden	1	9	--	--
Switzerland	48	580	18	136
Taiwan	5	95	10	202
Trinidad and Tobago	4	17	2	5
Turkey	1	21	--	--
Turks and Caicos Islands	--	--	(2/)	5
United Arab Emirates	1	19	--	--
United Kingdom	49	1,060	3	98
Venezuela	18	66	--	--
Total	843	12,000	223	5,130

-- Zero.
1/ Data are rounded to no more than three significant digits; may 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 2000, BY COUNTRY 1/

					Other			
	Split block		Splittings		Less than one dollar per kilogram		More than one dollar per kilogram	
Country	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Belgium	--	--	--	--	--	--	(2/)	$4
Canada	--	--	--	--	130	$18	--	--
China	--	--	--	--	1,950	237	(2/)	$10
Cote d'Ivoire	--	--	--	--	122	15	--	--
Finland	--	--	--	--	309	60	2	187
India	107	$115	4,020	$1,240	2,880	500	274	486
Madagascar	(2/)	3	--	--	--	--	--	--
Total	107	118	4,020	1,240	5,380	830	277	686

-- 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 2000, BY COUNTRY 1/

	Powder		Waste	
Country	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Argentina	1,100	$1,670	--	--
Austria	22	6	--	--
Brazil	--	--	20	$26
Canada	19,700	7,270	--	--
China	61	13	--	--
Finland	350	30	--	--
France	--	--	36	19
Germany	46	290	--	--
India	138	54	725	395
Italy	19	12	--	--
Japan	569	3,380	--	--
Madagascar	--	--	18	19
Norway	37	26	--	--
Peru	(2/)	2	--	--
Total	22,100	12,800	799	459

-- 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 2000,
BY COUNTRY 1/

Country	Plates, sheets		Other	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Australia	3	$71	--	--
Austria	3	58	5	$118
Belgium	598	6,030	--	--
Brazil	59	341	--	--
Canada	1	18	(2/)	29
China	123	359	24	219
Colombia	52	122	--	--
Denmark	135	338	--	--
France	23	153	1	37
Germany	(2/)	18	2	95
Hong Kong	1	5	5	46
India	50	735	52	885
Ireland	--	--	(2/)	3
Japan	4	115	11	277
Korea, Republic of	15	86	32	64
Sweden	--	--	(2/)	10
Switzerland	68	1,370	--	--
Taiwan	(2/)	3	3	13
Turkey	29	143	--	--
United Kingdom	9	232	(2/)	25
Total	1,170	10,200	135	1,820

-- Zero.
1/ Data are rounded to no more than three significant digits; may 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:								
1999	7,320	$4,010	3,950	$1,290	452	$2,150	840	$16,600
2000	8,880	4,610	1,380	383	209	343	1,070	17,100
Imports for consumption:								
1999	20,600	11,300	5,070	1,150	2,770	1,520	1,780	12,800
2000	22,100	12,800	6,180	1,290	4,400	2,040	1,310	12,000

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

Source: U.S. Census Bureau.

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

(Metric tons)

Country 3/	1996	1997	1998	1999	2000 e/
Argentina:					
Sheet e/	297 4/	300	300	300	300
Waste, scrap, etc.	1,840	3,228	3,200 e/	3,097 r/	3,100
Brazil	7,000	4,000	4,000 r/	5,000 r/	5,000
Canada e/	17,500	17,500	17,500	17,500	17,500
France e/	8,000	8,000	10,000	10,000	10,000
India:					
Crude	1,894	1,794	1,489	1,500 e/	1,500
Scrap and waste	1,413	1,128	966	1,000 e/	950
Total	3,307	2,922	2,455	2,500 e/	2,450
Iran 5/	3,000 e/	3,000 e/	1,084 r/	1,425 r/	2,000
Korea, Republic of (all grades)	35,923	34,489	38,459	24,733 r/	30,000
Madagascar (phlogopite)	450 e/	603	212 r/	491 r/	491
Malaysia	5,501	5,708	3,642	3,675 r/	3,700
Mexico (all grades)	4,273	975	890	971 r/	1,058 4/
Morocco e/	-- r/	-- r/	-- r/	-- r/	--
Peru e/	100	100	100	100	100
Russia e/	100,000	100,000	100,000	100,000	100,000
Serbia and Montenegro e/	200	200	150	50	100
South Africa (ground and scrap)	1,515	1,423	1,556	1,010 r/	707 4/
Spain e/	2,507 4/	2,500	2,500	2,500	2,500
Sri Lanka (scrap)	2,400	3,700 r/	2,800 r/	1,425 r/	1,500
Taiwan	8,510	7,806	7,750	7,000 r/ e/	7,000
United States (scrap and flake) 6/	94,700 r/	112,000 r/	87,000 r/	95,400 r/	101,000 4/
Zimbabwe	42 r/	30	1,309	1,300 e/	1,300
Grand total	297,000 r/	308,000 r/	285,000 r/	279,000 r/	290,000

e/ Estimated. 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, 2001.

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 March 21 of that stated.

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