WELCOME TO

MICAZONE

YOUR GATEWAY TO INDUSTRIAL MICA

MANUFACTURED *BY*

TOUGH INTERNATIONAL (P) LTD.

EXPORTED BY

MICROFINE PRODUCTS LIMITED.

D159, HANUMAN NAGAR, JAIPUR 302021, INDIA

PHONE: +91 141 409075 • 355825

FAX: +91 141 352743

Web: http://micazone.tripod.com

Email: tough@datainfosys.net

About Mica

Mica is a group of silicates having a prismatic angle 120°, eminently perfect basal cleavage, affording than tough laminae or scales, colorless to jet black, transparent to translucent, of widely varying chemical composition and crystallizing in the monoclinic system.

Mica is formed by flat six-sided monoclinic crystals with a remarkable cleavage in the direction of the large surfaces, which permits them to split easily into optically flat films, as thin as one micron in thickness. When split into thin films, they remain tough and elastic even at high temperature.

The crystal structure of MICA is silicon as basic skeletal structure. Its stratified combination is connected by potassium atoms and is separated by cut off combination at this place due to the binding force of potassium and oxygen is very weak.

The chemical composition of mica varies significantly with mining areas. The most important micas for industrial use are Muscovite mica that consists of potassium as a key ingredient and Phlogopite mica that consists of magnesium.

Mica is used in the electrical industry as a dielectric in capacitors and as an electrical insulator in motors, electron tubes, transistors, and appliances such as toasters, kettle, oven and flatirons.

Ruling governing hygiene and safety forbid the use of asbestos, which fibrous nature constitutes a health hazard.

All Mica Products are 100% ASBESTOS FREE processed from Natural Mica that are totally harmless. They represent very high thermal and mechanical performances, leading it to successfully replace asbestos in most of application in total.

CHEMICAL PROPERTIES

Mica has outstanding chemical properties. Mica is a complex hydrous silicate of aluminum containing potassium, magnesium, iron, sodium fluorine and/or lithium and also traces of several other elements. It is stable and completely inert to the action of water, acids (except hydrofluoric and concentrated sulfuric), alkalis, conventional solvents, oils, and is virtually unaffected by atmospheric action.

Typical Chemical Properties

Element	Muscovite	Phlogopite	Synthetic
Silica as SiO_2	45.51 %	38.55 %	41.5 %
Alumina as Al_2O_3	34.32 %	16.5 %	12.1 %
Ferric as Fe_2O_3	< 1%	< 5 %	Trace
Magnesium as MgO	0.55 %	25.71 %	29 %
Fluoride as F	Nil	Nil	9.1 %
Calcium as Cao	Trace	Trace	Trace
Titanium as TiO_2	0.50 %	1.21 %	Nil
Potassium as K_2O	10.97 %	10.54 %	11.5 %
Sodium as Na_2O	3.02 %	2.78 %	Trace
Moisture as H_2O	4.05 %	2.25 %	< 1 %
L.O.I. at 900 °C X 3 Hrs.	< 5 %	< 1 %	< 1 %

MECHANICAL PROPERTIES

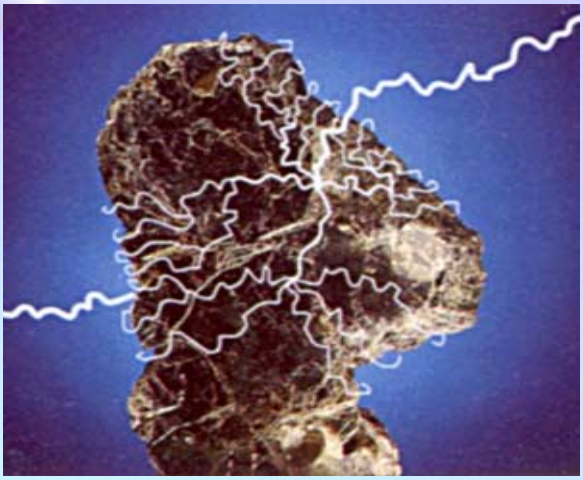
Mica is transparent, relatively soft, optically flat, easily split table into thin films along its cleavage, colorless in thin sheets, resilient and incompressible.

Mica has extraordinary mechanical properties. It has very good compression resistance, good tensile and bending strength and large elasticity modulus. It is flexible, elastic and tough, having high tensile strength. It can withstand great mechanical pressure perpendicular to plane.

Typical Mechanical Properties

Description	Muscovite	Phlogopite	Synthetic
Water Absorption	Nil	Nil	Nil
Compressive Strength /PSI	25000	15000	25000
Hardness Mohs	2.8~3.2	25 ~ 3.0	2.8~3.2
Shore Hardness	60 ~ 105	70 ~ 100	60 ~ 105
Density g/cm^3	2.7~3.0	2.6 ~ 2.9	2.75 ~ 2.85
Tensile Strength MPa	290~440	150 ~ 290	290~440
Compressive Strength MPa	490~690	290 ~ 490	490~690
Modulus of elasticity MPa	(14~21)X10^4	(14~21)X10^4	(14~21)X10^4
Acid Reaction H_2SO_4	No affect	No affect	No affect
Alkali reaction NaOH	No affect	No affect	No affect
Refrection Index	50° ~ 70°	5° ~ 25°	70° ~ 80°

ELECTRICAL PROPERTIES



Mica excels in electrical properties. Mica has the unique combination of great dielectric strength, uniform dielectric constant and capacitance stability, low power loss (high Q factor), high electrical resistivity and low temperature CO-efficient and capacitance. It is noted for its resistance to arc and corona discharge with no permanent injury, and has little or no effect when exposed to electronic radiation dosages up to 10^{18} nvt. Thus maintains a perfect dielectric material when exposed to the oxidizing action of electrical discharges either on the surface or within internal gas spaces in mica insulation.

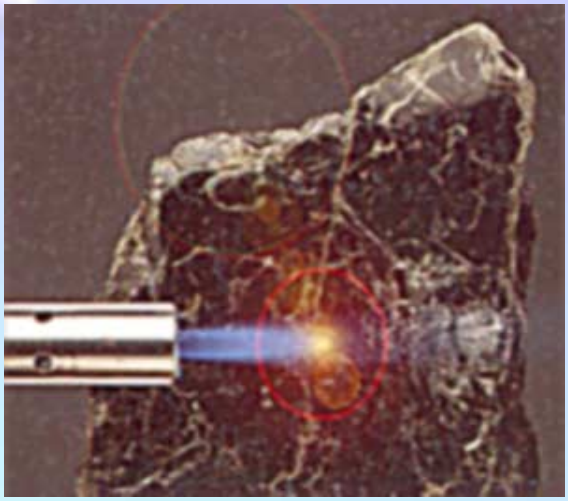
It has insulating strength better than 25 kV /mm. They have permeability to microwaves.

Typical Electrical Properties

Description	Muscovite	Phlogopite	Synthetic
Volume resistivity /Ω CM^2	10^{14}~10^{16}	10^{12}~10^{12}	10^{14}~10^{16}
Surface resistivity Ω	$3X10^{13}$	$3X10^{10}$	$3X10^{13}$
Dielectric Strength kV/0.1 mm	18~25	12~17	18~25
Dielectric Constant/100 MHz	5.2~6.4	4.6~6.0	5.8~6.4
Dissipation factor at 1 MHz	6 ~ 9	5 ~ 6	6 ~ 9
Power Factor at 50 Hz %	0.01~0.03	0.1~0.5	0.01~0.03
Power Factor at 1 MHz %	0.08~0.09	0.3~0.7	0.08~0.09

THERMAL PROPERTIES

Mica has exceptional thermal properties.



Mica is fireproof, infusible incombustible and non-flammable and can resist temperatures of 600°C to 1250 °C depending on the type of mica. It has low heat conductivity, excellent thermal stability and may be exposed to high temperatures without noticeable effect.

Depending on type of Mica, it has calcinations temperatures as high as 1250 °C. They have great resistance to arc and arc erosions.

Typical Thermal Properties

Description	Muscovite	Phlogopite	Synthetic
Heat endurance	500 °C	850 °C	1250 °C
Thermal Conductivity W/M°K	0.67	0.67	0.67
Coefficient of expansion per °C	$(9\sim36)X10^{-6}$	$(30\sim60)X10^{-6}$	$(9\sim36)X10^{-6}$
Specific Heat	0.206~0.209	0.206~0.209	0.206~0.209
Fire Grade	500 °C	800 °C	1200 °C
Heat Loss at 500 °C %	< 0.50%	< 1%	< 0.20%
Calcination Temperature °C	800	1000	1400

APPLICATION

Motors & Generators

Armature Coil, Commutator, Heat Sink, Rotating field Coil, Bushing, Coil, End Laminate, Lead Insulation, Mid-stick, Phase insulation, Slot cell, V-Ring, Wedge.

Transformers

Core and Barrier Tubes, Coil insulation, End pack out, Inter-phase and Inter-layer insulation, Turn Insulation layer, Wire Wrap.

Electric Heating appliances

Coffee percolator, Curling Iron, Flat-Iron, Hair Dryer, Hot plate, Rice Cooker, Soldering Iron, Toaster, Waffle Iron, Branding Iron, Glue pot, Laundry Iron, Lead pot, Surface Heater.

Electrical Controls

Electrical and Thermal Regulator, Grid resistance Box, Industrial motor starter, Motor control panel, Rheostat rod and terminal.

Electrical lighting equipment

Arc lamp, Dimmer Switch, Flasher, Large Incandescent Lamp, Liner for Lamp Shade, Neon-Light.

Mechanical Uses

Compass cards, Diaphragms for hearing aids, Oxygen breathing apparatus, Quarter wave plates for optical instruments, Shields for liquid level, Stove and furnace inspection windows.

Uses in Electronics

Capacitor, Geiger-Mueller Counter, Magnetic head of computer, Microwave Window, Solid state application, Transistor Shield, Tube, Vacuum Tube, X-ray Apparatus.

MUSCOVITE

Muscovite is Potassium-sodium hydroxyl alumino-silicate. Magnesium and iron substitute for aluminum, also chromium or vanadium. Also known as RUBY MICA is chemically inert when in contact with the chemicals typically used in electrical insulation. Mica is attacked by HF and H_2SO_4, but it is resistant to other acids, solvents, and alkalis. Unless precautions are taken, liquids such as water or oil can work their way in between the laminae of mica by capillary action. Water lowers the electrostatic force of attraction between the layers of mica by an exchange mechanism of hydroxyl for potassium ions.

Out gassing becomes intense above 600 °C, and prolonged exposure at high temperatures results in further release of water and finally in decomposition of mica. For this reason, mica spacers and insulators should be out gassed before being used in vacuum tubes or other devices where out gassing is a problem.

The electrical resistivity of muscovite decreases with increasing temperature. Because of the removal of moisture from the surface as well as from between the exfoliated layers, the electrical resistivity of the degassed mica is higher than that of the untreated material.

Muscovite has a high dielectric strength that averages between 3000 and 6000 volts/mil at 60 Hz. It has a relatively stable dielectric constant over a wide frequency range. Muscovite also has a dissipation factor ($\tan\delta$) that decreases with frequency. This makes Muscovite Ruby Mica an especially useful dielectric for high frequency application.

The Muscovite mica provides excellent electrical properties and the thermal decomposition temperature is about 600 °C.

PHLOGOPITE

Phlogopite is hydrous magnesium aluminum silicate having the chemical formula $H_2\ KMg_3\ Al\ (Si0_4)_3$. It varies in color from light silver to dark brown or amber, and is classified according to its shade, viz.; silver-amber, dark-amber, light-amber and wine-amber. Phlogopite is not transparent but only translucent and is softer then Muscovite and less resistant to outside chemical action but has greater heat resistance. It can withstand temperature up to 1000 °C (1800 °F) without appreciable dehydration. Because of its higher thermal stability, phlogopite mica is considered more suitable for applications where the high resistance to heat is required.

Also know as Amber Mica, is more stable at higher temperatures up to 1000 °C. However, the higher dissipation factor and lower dielectric strength of Phlogopite prevents it from being used in capacitor applications. Phlogopite is used mainly for insulation in transformers, motors, and soldering irons and as insulating washers or discs. The thermal conductivity of Phlogopite is about the same as that of muscovite.

Phlogopite mica provides a higher heat resistance with a thermal decomposition temperature as high as 800 ° C. In addition, they perform excellent flexibility.

It is not available in uniform large sheets hence primarily suitable for the manufacture of mica paper laminates for use in high temperature applications like Fire Resistance Tapes, Wire Winding Cards, Commutator Segments, Gasket Materials, electric soldering irons, etc.

VERMICULITE

Vermiculite is a hydrated laminar magnesium-aluminum-iron-silicate which resembles mica in appearance. When subjected to heat, due to the inter-laminar steam generation, it exfoliates or expands several times.

Vermiculite mined, cleaned and then screened or classified into several basic particle sizes. The bulk density of crude vermiculite or vermiculite concentrate is in the range of 640-1120 kg/cu m or 40-70 lb/cu ft.

Application Categories

Industry

Paints, Molded products, Brake pads & shoes, Fireproof safes, Filtration, Insulation, Insulation blocks & shapes, Furnaces, Sealants, Fixation of hazardous materials, Castables, Drilling mud Nuclear waste disposal, Absorbent packing, Perfume absorbent, Molten metal insulation, Dispersions.

Civil Construction

Gypsum Plaster, Air setting binder, Board, Loft insulation, Fire protection, Acoustic finishes, Floor & roof screeds, Lightweight Insulating Concrete, Sound deadening compounds.

Agriculture

Animal feed, Pesticide, Fertilizer, Bulking Agent, Seed encapsulant, Anti-caking material, Soil conditioner.

Horticulture

Seed germination, Sowing composts, Seedling wedge mix, Blocking mixes, Rooting Cuttings, Micro-propagation, Twin scaling bulbs, Potting mixes, Hydroponics.

FLUOROPHLOGOPITE

It is a synthetic form of Mica produced from a balanced mixture of high purity minerals and chemicals through melting at very high temperature and crystal formation technique. It is also known as ”Fluorophlogopite” Mica.

The cleavage of synthetic mica is similar to that of natural muscovite mica. It has a lower dielectric strength than muscovite. However, they exhibit much higher heat endurance up to 1300 °C.

It is colorless transparent with excellent transmittance to infrared or ultraviolet rays.

They possess excellent chemical stability and do not contain water; they can safely be used under high vacuum without gas outgoing. It is widely and safely used as spacers in High Pressure Vacuum Devices.

Due to high temperature endurance, it is used for Gasket seals for automotive exhaust systems in the form of laminates and for insulating fire resistant electrical cables in the form of Tape.

Synthetic Mica Powder being iron free is widely used in automotive metallic paints since it does not change due to weathering.

Fluorophlogopite Mica is available in the form of;

- Small Single Crystals (Very Expensive)
- Paper & Paper Laminates
- Tape
- Powder

Mica Material Safety Data

SCOPE

This information is provided pursuant to the HEALTH & SAFETY AT WORK etc. Act prevailing in effective areas.

PRODUCT: Mica Products.

CHEMICAL PROPERTIES

- SiO_2 = < 45 %
- Al_2O_3 = < 9 %
- CaO = < 2 %
- K_2O = > 11 %
- NaO = < 0.6 %
- MgO = < 26 %
- Fe_2O_3 = < 0.25 %
- Binder = < 10% (Silicone)

POTENTIAL HEALTH HAZARD

Inhaling Mica dust can cause occupational asthma. Prolonged skin contact may cause drying and irritation. Particles of ground mica can cause eye irritation.

Prolonged exposure to high levels of dust may cause pulmonary fibrosis (Scarring of Lung Tissues.)

It is advisable that people with a history of asthma, eczema. Hay fever or chronic skin complaints should not be exposed to Mica Dust.

Providing recommended working practices viz. Use of face mask, Cap and gloves are followed any risk to health will be very small. Avoid breathing Mica Dust.

Storage Guideline

The following guidelines are observed during handling and storage:

- Keep away from moisture and dust and should be stored in cool and dark place avoiding direct sunlight.
- Remaining unused portion of the material should be covered with a moisture proof paper or store them at cool & dry place.
- Put attention to the number of piles stacked up when handling plates or sheets. Stacking too high on pile may cause adherent problems.
- Do not handle with wet or oil stained hands which may cause adverse effect on the electrical insulating properties.
- The products which contain scarce bonding resin. Properties will be damaged particularly by moisture absorption. Care must be taken to avoid contact for even a short period of time ay extreme and high humid conditions.
- The processed product by cutting or punching tends to absorb moisture more actively particularly at the edges. They should be kept in a Plastic bags or equivalent.
- As and when solvent is used for softening the Mica products, care must be taken against fire hazards and the remaining products must be kept in a seal tight condition.

PROCESSED MICA

Muscovite Mica ore coming out of mines are in crude form contaminated with various foreign materials; hence for commercial purposes it is processed and classified in different forms on the basis of Size, Thickness and Quality as follows:

The standard grading system for all full-trimmed muscovite mica is based on the minimum usable rectangle (usable area) that may be cut from the specimen.

The grade designations for muscovite mica block, film and splitting and the corresponding areas of the usable rectangle with minimum dimension of one side shall be as given in Table below. All mica block, film and splitting shall contain a fair production of sizes throughout the entire range of the specified grade.

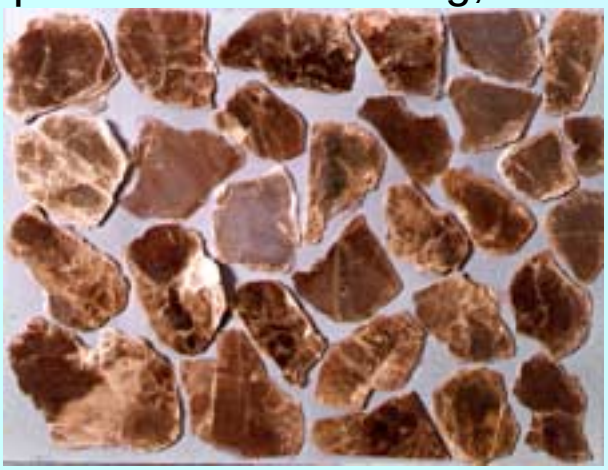
Size Grading	Area Of Usable Rectangle CM^2	
GRADE	From (Including)	To (Excluding)
OOEE SPECIAL	> 645	
OEE SPECIAL	516	645
EE SPECIAL	387	516
E SPECIAL	310	387
SPECIAL	232	310
1	155	232
2	97	155
3	64	97
4	39	64
5	19.4	39
5.5	14.5	19.4
6	6.4	14.5
7	4.8	6.4

MINES SCRAP

Scrap mica obtained in course of Cobbing, rifting and dressing crude mica as extracted from the mine, by means of a sickle, as well as, recovered by means of hammer-crushing cross-grained mica, which cannot be used as sheet mica for commercial purposes, is classified as mine scrap. It is screened as per customer's specifications for required sieve openings and supplied. Mine scrap is clean, dry, hard, and free from mineral and non-mineral impurities. It is a by-product of mining.

FACTORY SCRAP

Factory scrap is obtained as bye product of trimming, and fabricating sheet mica. Mica cuttings obtained in course of trimming and dressing sheet mica in the factory by sharp knife, as well as recovered during cutting and stamping sheet mica into pieces of definite size and shape by sear and punch is classified as factory scrap or cuttings.



Superior quality mica scrap is used for reproducing Mica Paper & High Quality Mica Flakes while inferior grade is used for grinding purpose to produce Mica Powder & Flake.

MICA BLOCK

Knife dressed sheet mica of a minimum thickness of 0.18 mm (0.007 Inch), is called Block mica.They are available both in random and calibrated thickness as per requirement.

The classification of muscovite mica blocks are as given below:-

V-1 & 2 Ruby Clear and Good Stained: - Hard, of uniform color, free from all vegetable and mineral stains, cracks, buckles and other similar defects and foreign inclusions. Very slightly wavy, and may contain slight air-inclusions.

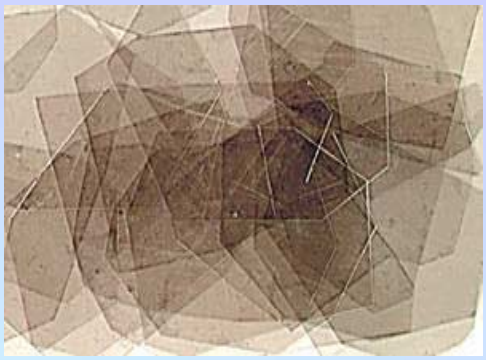
V-3 & 4 Ruby AQ and Stained First:- Hard, free from cracks and other similar defects and foreign inclusions, expect that may be wavy with slight buckles and may contain medium vegetable stains which are usually brown diffused stains, mineral stains and air-inclusions.

V-5 Ruby BQ and Stained "B":- Hard, free from cracks and other similar defects and foreign inclusions, expect that may be wavy and slightly buckled and may contain heavy air-inclusions, heavy vegetable stains and medium mineral stains and black dots and may contain diffused brown stains and clay.

V-6 Ruby Heavy Stained:- May be softer than better qualities but free from foreign inclusions and other similar defects, may contain marginal cracks, may be wavy and buckled, may contain heavy air-inclusions, heavy vegetable stains, medium mineral stains and black dots.

V-7 & 8 Spotted and Densely Stained: - Hard, free from cracks and other similar defects and foreign inclusions, expect that may be medium wavy and may contain slight buckles and vegetable stains, black and tiny red spotted mineral stain and heavy air-inclusions.

MICA FILM



Scissor dressed sheet mica split from superior quality block mica to required range of thickness between 0.2 up to 0.18 mm (O.0008 up to O.007 Inch) is called Mica Film. Mica Film is used as a dielectric in capacitors and other electronic products.

Precisely calibrated thickness, clean cut edges without fraying or splitting, flawlessness and free from stains, spots, dots, impurities, cracks, buckles, pinholes, etc. are some of the essential points observed in the manufacture of film mica.

Scratch less Laminae and or without scales are processed for critical applications on request.

Visual quality classification of muscovite mica films shall fall with the following categories:

First Quality: - Hard, of uniform color, free from vegetable and mineral stains and foreign inclusions. Free from cracks, buckles and other similar defects. May be slightly wavy and any contain slight air-inclusions in not more than 1/3rd of the usable area. Crystallographic discoloration is permitted to a limited extent.

Second Quality: - Hard, free from cracks, mineral stains and other similar defects and foreign inclusions. May be medium wavy with slight buckles and may contain slight vegetable dots. May have air-inclusions, but not heavily concentrated in not more than 3/4th of the usable area. Crystallographic discolouration is permitted to a limited extent.

Third Quality: - Free from cracks and other similar defects and foreign inclusions expect that may be wavy with slight buckles and may contain medium vegetable stains which are usually brown diffused stains and the entire area may have air-inclusions if not heavily concentrated. Crystallographic discoloration is permitted.

MICA SPLITTING

Laminae split from inferior quality Mica Blocks, in thickness of ten sheets, of which taken together does not exceed 0.30 mm (0.012 Inch), is called splitting mica. Splitting mica chiefly used in the manufacture of built-up mica or Micanite products as raw materiel for ultimate use as an Insulating material.

Book Form Splitting is Mica Splitting arranged and supplied in the form of individual books, each book comprising of consecutive Splitting obtained from the same piece of block or thin mica is known as Book-form splitting. Book-form splitting is dusted with pure mica powder to offset residual cohesive forces.

Dusted Loose Splitting is Mica laminae of heterogeneous shapes, not arranged in any regular order but packed loosely in bulk form dusted with pure mica powder to offset residual cohesive forces, is called dusted loose Splitting.

Loose Splitting is Mica laminae of heterogeneous shapes, not arranged in any regular order but packed loosely in bulk form packed without Mica Powder, is called dusted loose Splitting.

Wrapper Mica is Laminae split in very thin and particular specified thickness from blocks and thins and furnished as book- form. Splitting arranged and supplied in the form of individual books or bunches, each book comprising consecutive Splitting obtained from the same piece of block mica or thins. Wrapper mica are split to less then 3/4 mil and packed without dusting.

FABRICATED MICA

The term ***FABRICATION*** applies to various processes, such as cuttings, stamping and punching of natural sheet mica to a specified size, shape, thickness and design within close dimensional tolerances for electrical and electronic end-uses.

Natural mica being available only in flat sheets, fabrication of mica are per- formed on a production basis by using foot or power punch presses by the help of a compound die similar to those used in metal stampings. Where the quantities are not large enough to permit the cost of a die, mica may also be hand-sheared, drilled or lathe turned on any of the common tools used for machining metals. A template is used for accurate dimensional measurement. Machine speeds should be similar to those used for machining brass.

Normally, mica is fabricated with compound dies by foot or power punch process, especially if the finished piece contained perforation of any kind. A compound die punches the outside shape and all the inside holes with one stroke of the press most accurately.

A different die is required not only for each change in the pattern, but also for each change in thickness for precision work. The mica is fed to the press by hand. Mica pieces whether in the form of block, thins, or films, are usually calibrated to close range of thickness for precision punching, as it is an important variable in the process. An uniformly thick mica fed to a die improves the cutting quality of the die and produce parts having contour and holes. Mica films for capacitors are usually fabricated within a very close range of thickness tolerances.

PUNCHED PART

Mica punched parts are fully customized to given drawings in terms of quality, size, thickness and critical shapes and they are used in various applications including:

Capacitor Plates: Mica films of superior grade, split and gauged are used in the manufacture of silvered mica plates and mica capacitors.

Target and Mosaic Mica: Superior quality mica films, optically flat, free from scratches, finger prints and other imperfections, having uniform color are used as target and mosaic mica in image orthicons in telecasting industry.

Communication Devices: High quality muscovite discs and sheets coated with gold or silver patterns are used in communication devices as conductor support bar.

Marker Dials: Superior quality mica discs are used withstands sudden shocks, strains and vibrations, weathering effects and changes as marker dial for navigational compasses in ships, submarines and airplanes.

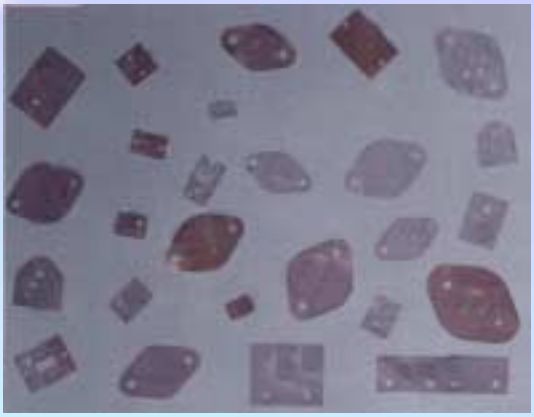
Sand Castings: Mica parts with multiple holes are used as strainers in metal sand castings. They act as a choked and strainer during pours and helps eliminate getting dross or contaminated.

Diaphragms: Due to flatness and rigidity mica sheets, discs of superior quality are used as diaphragms for oxygen breathing equipment.

Microscope Research Mica

High Quality & scratch free Natural Mica is cut to fit microscope slides. This mica peels off very thin and uniform layers, exposing "virgin" mica upon each peeling.

PUNCHED INSERT



Mica inserts are fully customized to given drawings in terms of quality, size, thickness and critical shapes and they are used in various applications including:

Jet Engines: These engines are put into motion by a magnet, which depends for efficient functioning on a support of a mica component.

Transistor and Semiconductor: Mica Parts are used as washers and supports for both electrical and heat insulation due to their excellent mechanical and thermal properties. Mica parts help the component by insulating from the chassis and to dissipate the heat away from the components & keeping them cool. Its added advantages are low moisture absorption, high breakdown voltage and high resistance to surface leakage.

Neon Lights: Mica is used as insulation in the glass cylinder enclosing the electrodes of Neon-light signs.

High Voltage Lamps Because of its excellent electrical, mechanical and thermal properties sheet mica of medium quality are used as supports of the leads to the intensely hot glowing tungsten filaments of high power GLS lamps. Mica permits the lamps to withstand vibration and shock during operation and prevent gassing in the operating environment of lamps.

Miscellaneous Uses: Lamps, Fuse Plugs, Electric Lamp Socket, Lighting Apparatus, Grid Rheostats, Insulating washers, Discs and terminal plates for incandescent lamps, Fuse plugs, Fuse boxes, Electric lamp sockets, Lightning arresters, Induction coils, Insulation for motor controls and other General electric insulation in devices.

WINDOW PLATE

Mica window plates are fully customized to given drawings in terms of quality, size, thickness and critical shapes and they are used in various applications including:

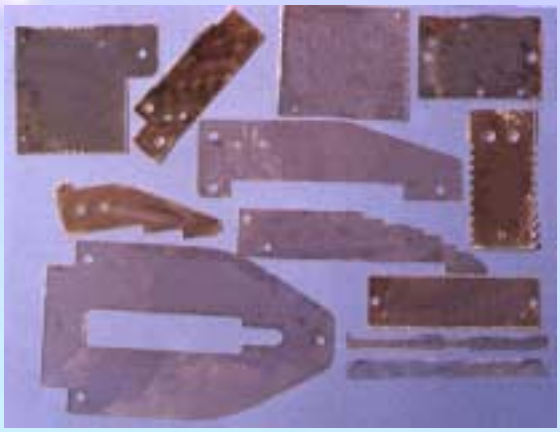
Microwave Tube Windows: Clear mica sheet, absolutely flat, free from scratches, fingerprints and partial layers are used as microwave tube windows. Mica serves as a transparent path for microwave transmission attenuators. The excellent mechanical strength of mica to withstand pressure up to 5000 PSI, and low power loss at ultra-high frequencies are some of the attributes which necessitates use of mica for this application. Besides, mica can readily be assembled to the metal by applying low temperature methods and still provide a vacuum tight seal.

Stove Windows: Mica is used as viewing windows for wood stoves and other fuel burning stoves. Mica is used as thermal shield for Anthracite gas or kerosene stove (Aladdin stove), Isinglass furnace peephole, heat screen, metallurgical furnace and kiln, canopy, shield, smoke helmet, gas analysis of polarized light, etc.

Radiation Insulation: Practically all the important properties of organic insulation are subject to drastic changes under irradiation. Natural mica, being a mineral and inorganic, undergoes far less drastic effects. Superior quality sheet mica is used as window covers in radiation pyrometers and thermal regulators.

Television: Optically transparent, scratch free sheet mica of superior quality is used as retardation plates of helium-neon lasers and iconoscope screens of televisions, as well as, reflectors and quarter wave plates in optical instruments.

PLATE & CARD



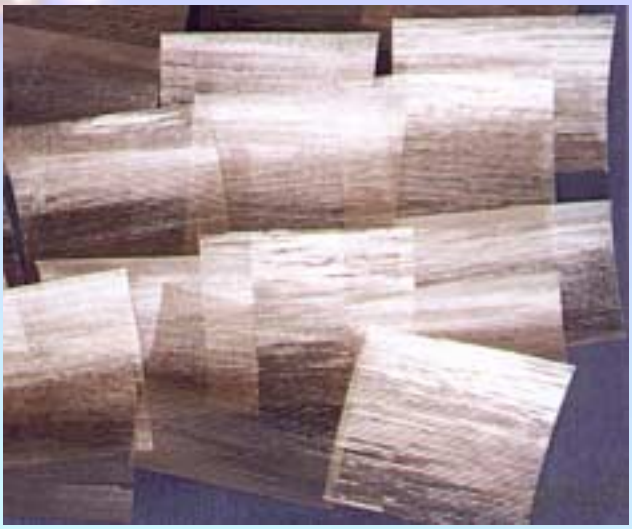
Mica plate and cards are fully customized to given drawings in terms of quality, size, thickness and critical shapes and they are used in various applications including:

Resistance and Potentiometer Cards: Mica is flexible in thin sheets and could easily wound around and bent into a circle to a diameter as small as 1/8th inch without fracturing. At the same time it has high mechanical strength and ability to withstand high temperature at ease. As such medium quality thin mica sheets are used as a non-conductive resistance cards, as well as, potentiometer cards as a base material.

Electric Heating Appliances: The largest non-electronic use of muscovite sheet mica of lower qualities are in the manufacture of electric heating appliances requiring non-inflammability and dielectric resistance, such as: flat-irons, toasters kettles, percolators, griddles, boilers, water heaters, ovens, rice cookers, slow cookers, radiators, hair dryers, soldering irons, glue pots, lead melting vats and other heating appliances. The main function of mica for the above applications is to support and separate heating elements and nickel-chrome resistance wire.

Sound Device Plates: Resonance and elasticity of mica makes it a good sound producer, receiver and transmitter of sound waves and therefore, it is particularly suitable for acoustics apparatus used in submarines and airplanes as diaphragms for detecting sound. It is also employed in the manufacture of other sound producing and sound detecting devices, such as detonators, radiophone, gramophone, sound boxes, headphone, loudspeakers etc.

CRIMPED SHEET



Crimped Mica are prepared from mica films in specific size and thickness and passed through a specially designed rolling machine to form vertical, horizontal or diagonal corrugated ribs. The rollers are designed to perform crimping very smoothly to precise dimensions without pilling or cracking mica sheets.

Crimped fabricated mica becomes very soft and easily single directional roll able for use in wrap insulation, where natural MICA is critically required.

Primary and Secondary Insulation: Natural mica absorbs practically zero moisture. It can be cleaned readily, is incompressible and not subject to cold flow. It also has the ability to withstand arcing and corona without permanent injury. These characteristics combined make fabricated crimped mica parts highly suitable for use in electronic and electrical apparatus both as a primary and secondary insulation.

High Tension Coil for Radars: Mica wrappers in specified thickness are used for thermal insulation of high-tension radar coils.

Soldering Irons: Fabricated and or Crimped Mica film wrapped around the entire length of the flat part of the copper bit of a soldering iron eliminate physical contact between the resistance wire and the copper bit to avoid short circuit. Mica also ensures low resistance to heat transfer and high efficiency in the operation of the instrument thus.

SHIELD & GASKET

Mica Shields & Gaskets are made of the highest quality muscovite natural mica, cut and punched to accurate specified dimensions and thickness, having very high degree of thru vision transparency.

Suitable for:

• Water Level Gauges • Liquid Level Gauges • Columns of High Pressure Steam Boilers.

USED IN

Tanks and Vessels of all kinds • Oil Refineries • Petrochemical Plants • Organic / Inorganic Chemical Plants Oil Refineries • Fertilizer Plants • Nuclear Power Stations • Thermal Power Stations • Electricity Generating Stations.

Typical Properties

Guarantee a direct reading and clear observation of liquid levels and its characteristics — provide a perfect visual indication to watch the nature and degree of combustion in blast furnaces of high-pressure steam boilers.

Mica Shields **protect** the inner surfaces of the gauge glass against erosion by steam and other elements and from the corrosive chemical effects of alkaline solutions, water, caustics, hot concentrated phosphoric acids sodium and potassium and other media.

Mica Shields **eliminates** completely the risk of breakage, cracks, jerks, thermal shocks combustion effects or fuses when used at higher steam pressures and working temperatures.

Mica Shields **increases** the service life of the gauge glass by retaining its basic strength when used at higher pressures and is a must where pressures exceed 350 PSI (2400kpa) @ 431° F.

GROUND MICA

Grinding of Mica Scrap properly cleaned by removing all types of foreign particles produces ground mica. They are tough and inert to most of the chemicals and thermal conditions while retaining elasticity and slipperiness far superior to conventional ground minerals or rocks.

Major applications includes Roof coating, Wall papers, Well-drilling mud, Paint pigment extender, fillers for plastic-rubber goods and flux material in welding electrodes.

Mica powder as a pigment is used in a binder like varnish or shellac to create metallic finishes. The advantage mica has over metal flakes is its inability to tarnish. It grows in a layered structure, kind of like an onion, and has a mother of pearl translucency. This is what gives mica powder its fantastic reflective quality. When these mica platelets are ground, they create a particle that is many faceted. Since mica is an inert mineral, it does not chemically react with any binder during or after application.

As with all pigment, the size of the particle of color is important and with some mica there is a choice between regular and micro which is extra finely ground.

Mica can be mixed together for creativity and precision when matching and creating coatings. In the past, mixing of customized metallic coatings was hazardous because airborne metallic powders are very toxic.

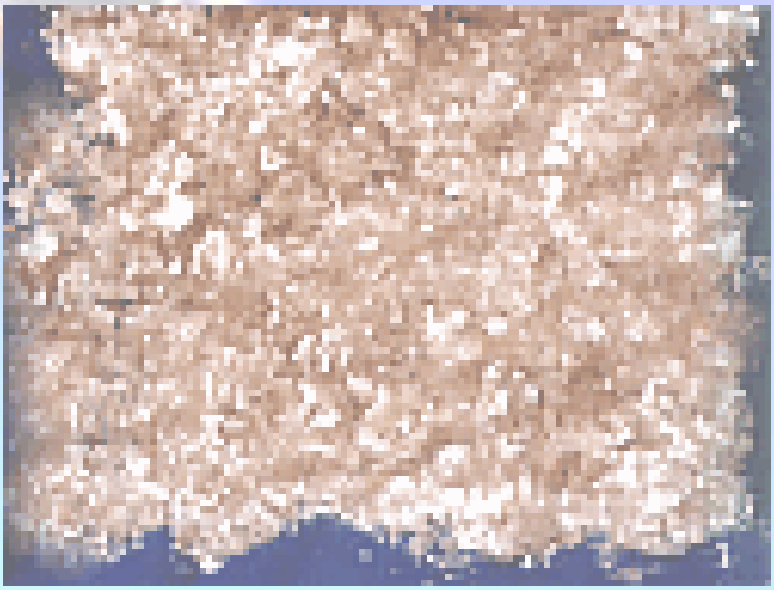
This makes for a more opaque and even surface. The pigment adheres to the surface of the binder. The binders of choice for this technique are the traditional linseed oil gilding size or the modern water based acrylic gilding sizes. These sizes can be pigmented with tinting pastes exploding creative possibilities.

TYPICAL PROPERTIES

Ground Mica has typical characteristics for various applications:

- Highly responsive to the action of light, heat, electricity, water & other chemicals.
- Transmits and reflects light to produce decorative effects and also prevents penetration of sun rays, moisture, heat & gases etc. on the surface it is coated with.
- Produces stiffening effect on calendared sheets.
- Have very high lubricating values.
- Produces leafing effect in liquids due to low specific gravity and as such remains uniformly disperse over the surface of liquid vehicles.
- Have excellent dielectric and thermal insulation properties due to inherent properties of natural mica.
- Has very little abrasive effect and can easily get wetted by resin and dyes.
- Has excellent anti-sticking properties and as such, during vulcanization it prevents sticking and movement of sulfur, at the same time, it permits the air bubbles to escape.
- Has re-enforcing and strengthening effect in the products with which it is mixed, hence prevents rupturing and improves adherence.

MICA FLAKE



Mica Flakes are crushed and flaked in Hammer Mils.

Appliaction:

6 Mesh: Acts as mud additive in Oil well.

10 Mesh: Acts as flocking material and provides glittering effects. Mainly used in Christmas ornaments, display materials, artificial snow.

16 Mesh: Provides thermal insulation and decorative finish. It is mainly used in concrete and stone bricks.

20 Mesh: Prevents sticking and improves weather proofing. It is used as an asbestos substitute. Mainly used in asphalt roofing, felt & shingles.

30 Mesh: Acts as disinfectant in explosives and absorbent in automotive break shoes.

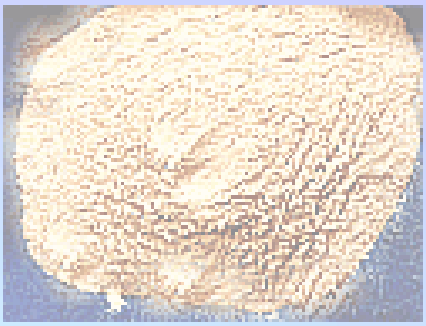
Calcined Flakes

Calcined Mica Flake is produced by grinding Mica Scrap properly cleaned by removing all types of foreign particles there after Calcining the raw material in a Rotary Kiln to out gas inter laminar water completely. They exhibit much superior properties than normal flakes.

They are tough and inert to most of the chemicals and thermal conditions while retaining elasticity and slipperiness far superior to conventional ground minerals or rocks.

MICA POWDER

Dry Ground Powder

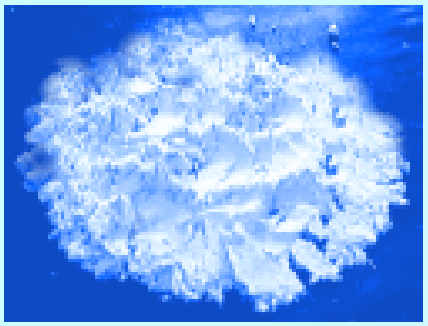


Dry Ground Mica Powder is processed in Pulverizing Machine up to 150 Mesh. This is mainly used

60 Mesh: It provides protective coating & improves dielectric, mechanical & electrical properties in wires and cables, Increases heat and chemical resistance in plastic or cement pipelines. It provides antismog & reduces cracking due to low expansion shrinkage & heat and chemical resistant properties in adhesives, plastic & rubber.

100 Mesh: Acts well as flux for high corona resistance in welding electrodes. It adds decorative finish, glittering effect and luster in texture paints, ceiling tiles.

Wet Ground Powder



Wet Ground Mica powder is processed in a ball chaser mill machine in which mica is subjected to grinding with water for several days. After grinding cycle is complete, they are dried and passed through a particle separator machine and sieved/classified. The main uses are:

100 Mesh: For architectural effects in texture paints, improved physical properties in ceiling tiles and increase weather proofing in paints.

200 Mesh: Due to high lubricating properties anti abrasion properties is used as mold release and decorative finish for Air Bags, tyre lubricants etc.

325 Mesh: Efficient Extender in Paint Pigments, Exterior paints aphid infestation control, fillers in plastic & hard rubber, glittering effect in cosmetic & automotive paints.

SPECIAL POWDER

Calcined Powder

Calcined Mica Powder mica is produced by grinding Mica Scrap properly cleaned by removing all types of foreign particles there after Calcining the raw material in a Rotary Kiln to out gas inter laminar water completely. They exhibit much superior properties than normal Dry Ground Powder.

They are tough and inert to most of the chemicals and thermal conditions while retaining elasticity and slipperiness far superior to conventional ground minerals or rocks.

Micronised Mica Powder

Micronised Mica Powder is produced by regrinding of pulverized 100 mesh powder by Turbo Rotor or Jet size reduction machines. This is mainly used as:

325 - 500 Mesh: To improve exterior durability, increase moisture resistance, weather proofing and corrosion resistant in Zinc & metal primers particularly for ships.

500 - 1000 Mesh: Imparts heat resistance, impact strength, improve dielectric properties, enhances thermal & electrical insulating characteristics in Plastic, Paper, Rubber, paints & cosmetics.

Also used in Lubricants, grease, fire extinguishers, fabrics, printing materials, dry color sealant, anti-friction compounds etc.

SPLITTING MICANITE

Mica in its natural form has limitations as to it processibility and versatility and also very high cost for large sheets. To acquire the flexibility, adaptability in consideration of cost factor, Splitting Micanite is a product in such a form that it is available in composite sheets and a variety of shapes, thickness and sizes.

Splitting Micanite, consisting of Plates, sheets, molded parts and tapes are made with mica splitting by lay-up, bonded with required thermal class binders and hot pressed. Optionally as per application requirement to add extra flexibility, tensile & mechanical strength a variety of reinforcing backing materials are added.

In addition to the inherent typical properties of Natural Mica Sheets, Outstanding mechanical strength, high dielectric strength, extreme corona resistance and good voltage endurance are few of the features of Splitting Micanite. Further more they also provide significant superiority in mechanical strength.

Major applications of the products are Commutator cones and segments and they are also used for turn insulation or an insulation material against the earth in high power and high voltage rotating machines.

DECORATIVE USES

Micanite plate has been used as a decorative product over many years. The combination of the mica flakes with the contrasting color intensity and tones of the binding resins create a unique, random lighting effect. Its primary use has been in lampshades and ceiling panels.

RIGID SHEET

Rigid Sheets are made from mica splitting being laid-up and bonded to each other with a desired thermal class resin. It is then set to sheet form by applying hot press. The used binder resin is controlled to maintain a stable and fully cured state to form dense and rigid sheets so that the sheets can be introduced to machining, shearing, punching or stamping to any required size without peeling.

They possess superior arc-welding resistance & tracking resistance. They provides stable compression resiliency over a wide temperature range, making it suitable for Commutator separator application and high dielectric and flexural strength, thermal stability, low moisture absorption & good arc and flame resistance.

Micanite rigid sheets can be freely used for rings & bushings as well as insulation in construction of control gears and apparatus, critical dimension parts, washers, spacers, discs and gaskets etc. as per application requirements.

Typical Properties

Description		RSP 401	RSE 401	RSS 401
Mica Splitting		Muscovite	Muscovite	Muscovite
Binder Resin		Shellac	Epoxy	Silicone
Thickness		0.2~1.0mm	0.2~2.0mm	0.2~2.0mm
Thickness Tolerance	Average ±	0.05	0.03	0.03
	Individual ±	0.03~0.05	0.03~0.05	0.03~0.05
Density g/cm^2		2.0~2.5	2.0~2.5	2.0~2.5
Mica Content % App.		85~90	90~95	86~90
Tensile Strength N/cm		-	80	30
Dielectric Strength kv/mm		> 40	> 50	> 40

FLEXIBLE SHEET

Flexible Sheets are made from mica splitting being laid-up and bonded to each other with a desired thermal class thermoplastic resin. It is then set to sheet form by applying hot press to get fully cured or semi cured flexible sheets. Semi cured sheets can be introduced to PRESS FORMING in any required shape without heating or a temperature between 100 °C to 110 °C and cured after obtaining desired shape.

They possesses excellent insulating properties, high mechanical strength and resistance to chemicals & temperature, sufficient permanent flexibility & adhesiveness to permit winding or wrapping of the sheet at room temperature.

Fully cures sheets are used as spacers, slot insulation, motor insulation, dry transformer, wrapping or layer insulation, separators and emergency repairs.

Semi cured sheets are used in Commutator V-rings & cones, insulation for stators, slots, field coils, slip rings and shafts. It can also be reproduced to clamps, sleeves, and tubes etc.

Typical Properties

Description		FSP 401	FSE 401	FSS 401
Mica Splitting		Muscovite	Muscovite	Muscovite
Binder Resin		Shellac	Epoxy	Silicone
Thickness		0.2~1.0mm	0.2~2.0mm	0.2~2.0mm
Thickness Tolerance	Average ±	0.05	0.03	0.03
	Individual ±	0.03~0.05	0.03~0.05	0.03~0.05
Density g/cm^2		2.0~2.5	2.0~2.5	2.0~2.5
Mica Content % App.		85~90	90~95	86~90
Tensile Strength N/cm		-	80	30
Dielectric Strength kv/mm		> 40	> 50	> 40

REINFORCED SHEET

Reinforced Sheet is produced from Mica Splitting being laid-up and bonded to each other with a high temperature resisting resins on a desired reinforcement backing material i.e. glass cloth, PVC etc. either on one side or both sides. It is then set to sheet form by applying hot press. The used binder resin is controlled to maintain a stable and semi cured state to form dense and flexible sheets so that the sheets can be introduced to forming in any required size without heating.

They possess high degree of tensile strength, rigidity, flexibility, uniformity, pliability, toughness & cohesion. By adding reinforcement backing material, the tensile strength is increased considerably.

Major applications of the Reinforced Micanite sheets are to reproduce insulation covering in transformers, coil insulation, bracing rings, and flange insulation.

Typical Properties

Description		RSP 401	RSE 401	RSS 401
Mica Splitting		Muscovite	Muscovite	Muscovite
Binder Resin		Shellac	Epoxy	Silicone
Thickness		0.2~1.0mm	0.2~2.0mm	0.2~2.0mm
Thickness Tolerance	Average ±	0.05	0.03	0.03
	Individual ±	0.03~0.05	0.03~0.05	0.03~0.05
Re-enforcement		Glass Cloth	Glass Cloth	Glass Cloth
Mica Content % App.		85~90	90~95	86~90
Tensile Strength N/cm		-	80	30
Dielectric Strength kv/mm		> 40	> 50	> 40

MICANITE TAPE

Micanite Tape is produced from Mica Splitting being laid-up and bonded to each other with a high temperature resisting resins on a desired reinforcement backing material i.e. glass cloth, PVC etc. either on one side or both sides. It is then set to sheet form by applying hot press. The used binder resin is controlled to maintain a stable and is fully cured state to form dense and flexible paper-like rolls and finally sliced to required width. Micanite Tape is supplied in Folium Rolls of 900/1000 mm width.

Micanite Tape possesses high degree of tensile strength, rigidity, flexibility, uniformity, pliability, toughness & cohesion. By adding reinforcement backing material, the tensile strength is increased considerably.

Major applications of the Micanite tapes are for insulation of cable, stator coil, armature coil, core iron, slot liner, copper conductor, rotor, motor, transformer layer, flange, cross- over, shafts etc and also suitable for phase separators and Fire resistant conduit wiring.

Typical Properties

Description		TSE 401	TSS 401
Mica Splitting		Muscovite	Muscovite
Binder Resin		Epoxy	Silicone
Thickness		0.12~0.16 mm	0.12~0.16 mm
Thickness Tolerance	Average ±	0.03	0.03
	Individual ±	0.03~0.05	0.03~0.05
Re-enforcement		Glass Cloth	Glass Cloth
Mica Content % App.		70 ~75	70 ~ 75
Tensile Strength N/cm		> 80	> 60
Dielectric Strength kv/mm		> 20	> 20

MOLDED PARTS

We reproduce formed, machined or punched parts from the Flexible Micanite sheets in any shape or size Customized to specific drawings.

Micanite tubes are formed with Flexible Micanite wounded around a heated mandrel in required layers to attain specific wall thickness and diameter. The tubes are then cured for binder under high temperature and baked.

Micanite formed parts are produced from moldable B stage resin cured flexible Micanite sheets being hot pressed in specific moulds of required design or shape. They are baked to attain optimum chracetrstics.

- Formed Parts: - V-Ring, Tube, Wedge, Barrier and Spacer etc.
- Punched Parts: - Plates, Insert, Washer and Disc etc.

Typical Properties

Description	MSP 401	MSE 401	MSS 401
Mica Splitting	Muscovite	Muscovite	Muscovite
Binder Resin	Shellac	Epoxy	Silicone
Thick./Inner Dimension Min	0.2 – 5 mm	0.2 – 5 mm	0.2 – 5 mm
Outer Dimension Max	400 mm	400 mm	400 mm
Density g/cm^2	2.0~2.5	2.0~2.5	2.0~2.5
Mica Content % App.	85~90	90~95	86~90
Dielectric Strength kv/mm	> 20	> 20	> 20

PAPER MICANITE

Paper Micanite is a sheet material/shaped material made from thin flakes of Mica that have been ground up & converted to pulp like paste, and pressed into sheet form, and heated under pressure to bond tiny mica flakes together. Mica flakes by its natural cohesive force stick together to form uniform sheet like paper. Reconstituted mica evolves more gas than the original mica, up to 500 °C. However, at 800 °C, natural mica becomes more gassy than reconstituted mica. Reconstituted mica is available in Sheet and Tape form with various configurations of binders & process as per thermal class ratings, and is used for insulators. It has a dielectric strength of 450~900 volts per mil. The properties of paper Micanite are highly reproducible in sheet form.

Paper Micanite provide in particular heat resistivity and electrical properties characteristic of mica and furthermore the materials retain better uniform thickness compared with the natural mica or Splitting Micanite. They perform excellent flexibility and taping capabilities, therefore taping onto coils can proceed easily.

HEATER PLATE

Heater Plate is processed by stacking mica paper to required thickness and bonded with a high temperature resisting Silicone resin and set to plate form by applying hot press. The resin is fully cured to form dense and rigid sheets so that the sheets can be introduced to shearing, punching or stamping to any required size without peeling.

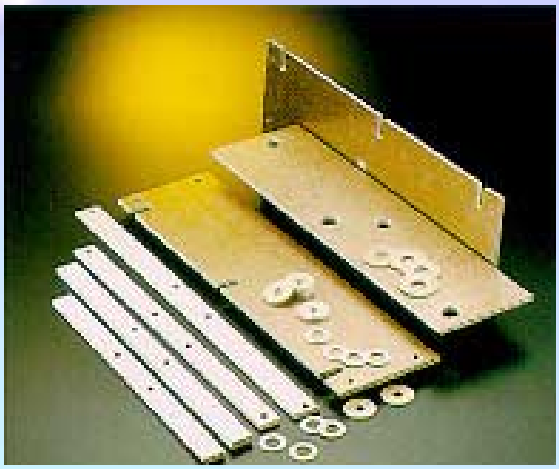
The product is heat proof & flame resistant with high mechanical strength excellent insulation properties under loaded high temperature. It does not emit either smoke or odor during heating.

They can be widely applied to reproduce winding boards for heating elements used in domestic appliances, Cover plates, High temperature spacers & washers.

Typical Properties

Description		HLM 501	HLP 501	HLF 501
Mica Paper		Muscovite	Phlogopite	Synthetic
Binder Resin		Silicone	Silicone	Silicone
Thickness		0.2~ 2.0mm	0.2~ 2.0mm	0.2~ 2.0mm
Thickness Tolerance	Average ±	0.02	0.02	0.02
	Individual ±	0.03~0.04	0.03~0.04	0.03~0.04
Density g/cm^2		2.0~2.5	2.0~2.3	2.0~2.2
Mica Content % App.		86~90	86~90	86~90
Compressibility at 200 °C	Under 300 kgf/cm^2	0.5~1.5 %	0.5~1.5 %	0.5~1.0 %
Elastic Compression %		1.0~1.5	1.0~1.5	1.0~1.2
Plastic Deformation %		0.6~1.2	0.6~1.2	0.6~1.0
Punchability		Clean Edge	Clean Edge	Clean Edge
Dielectric Strength kv/mm		> 20	> 25	> 30
Temperature Endurance		550 °C	850 °C	1250 °C

PUNCHING PLATE



Punching Plate is processed by stacking mica paper to required thickness and bonded with Silicone or Epoxy resin and set to plate form by applying hot press. The resin is fully cured to form dense and rigid sheets so that the sheets can be introduced to machining, shearing, punching or stamping to any required size without peeling.

The product is with high mechanical strength, high thermal resistance and excellent insulation properties.

They can be widely applied to reproduce punched insulating parts such as Plate, Separator, Disc, Spacer and Washers.

Typical Properties

Description		PLM 501	PLP 501	PLF 501
Mica Paper		Muscovite	Phlogopite	Synthetic
Binder Resin		Epoxy	Silicone	Silicone
Thickness		0.2~2.0 mm	0.2~2.0mm	0.2~2.0mm
Thickness Tolerance	Average ±	0.02	0.02	0.02
	Individual ±	0.03~0.04	0.03~0.04	0.03~0.04
Density g/cm^2		2.0~2.5	2.0~2.3	2.0~2.2
Mica Content % App.		86~90	86~90	86~90
Compressibility at 200 °C	Under 300 kgf/cm^2	0.5~1.5 %	0.5~1.5 %	0.5~1.0 %
Elastic Compression %		1.0~1.5	1.0~1.5	1.0~1.2
Plastic Deformation %		0.6~1.2	0.6~1.2	0.6~1.0
Punchability		Clean Edge	Clean Edge	Clean Edge
Dielectric Strength kv/mm		> 20	> 25	> 30
Temperature Endurance		550 °C	850 °C	1250 °C

PROFILE PLATE

Profile Plate is processed by stacking mica paper to required thickness and bonded with Silicone or Epoxy resin and set to plate form by applying hot press. The resin is fully cured to form dense and rigid sheets so that the sheets can be introduced to machining, profiling or sawing to any required size without peeling.

The product is with high mechanical strength, high thermal resistance and excellent insulation properties.

They can be widely applied to reproduce machined or profiled insulating parts such as Plate, Separator, Disc, Spacer, Washers and Dynamic Break Resistors.

Typical Properties

Description		PLLM 501	PLLP 501	PLLF 501
Mica Paper		Muscovite	Phlogopite	Synthetic
Binder Resin		Epoxy	Silicone	Silicone
Thickness		3 ~ 100 mm	3 ~ 100 mm	3 ~ 100 mm
Thickness Tolerance	Average ±	0. 2	0.2	0.2
	Individual ±	0.3~0.4	0.3~0.04	0.3~0.4
Density g/cm^2		2.0~2.5	2.0~2.3	2.0~2.2
Mica Content % App.		82~86	82~86	82~86
Compressibility at 200 °C	Under 300 kgf/cm^2	0.5~1.5 %	0.5~1.5 %	0.5~1.0 %
Elastic Compression %		1.0~1.5	1.0~1.5	1.0~1.2
Plastic Deformation %		0.6~1.2	0.6~1.2	0.6~1.0
Machineability		Clean Edge	Clean Edge	Clean Edge
Dielectric Strength kv/mm		> 20	> 25	> 30
Temperature Endurance		550 °C	850 °C	1250 °C

SEGMENT PLATE

Segment Plate is processed by stacking mica paper to required thickness and bonded to each other with a high temperature resisting EPOXY/SILICONE resins. It is then set to plate form by applying hot press and fully cured to form dense and rigid sheets so that the sheets can be introduced to machining, shearing, punching or stamping to any required size without peeling. They are further introduced to surface sanding to calibrate precision thickness.

The Commutator is the most important component in electric motors. Since the very high mechanical stresses that a Commutator has to withstand at varying temperature, high-class insulating material should be incorporated and here is the choice with Segment Laminates.

Typical Properties

Description		SLM 501	SLP 501	SLF 501
Mica Paper		Muscovite	Phlogopite	Synthetic
Binder Resin		Epoxy	Epoxy	Silicone
Thickness		0.2~1.5mm	0.2~1.5 mm	0.2~1. 5 mm
Thickness Tolerance	Average ±	0.02	0.02	0.02
	Individual ±	0.03~0.04	0.03~0.04	0.03~0.04
Density g/cm^2		2.0~2.5	2.0~2.3	2.0~2.2
Mica Content % App.		86~90	86~90	86~90
Compressibility at 200 °C	Under 300 kgf/cm^2	0.5~1.5 %	0.5~1.5 %	0.5~1.0 %
Elastic Compression %		1.0~1.5	1.0~1.5	1.0~1.2
Plastic Deformation %		0.6~1.2	0.6~1.2	0.6~1.0
Punchability		Clean Edge	Clean Edge	Clean Edge
Dielectric Strength kv/mm		> 20	> 25	> 30
Temperature Endurance		250 °C	250 °C	1250 °C

MOLDING PLATE

Molding Plate is processed by stacking mica paper to required thickness and bonded to each other with a desired thermal class thermoplastic resin. It is then set to plate form by applying hot press. The temperature for used binder resin is controlled and maintained to a stable environment and fully cured to form dense and flexible sheets.

Flexible laminates are used for insulation at critical shape places as wrap insulation, separators & layer insulation. It is also used in assembly of flexible heating elements for Hair Driers, Microwave oven etc. as winding cards.

Typical Properties

Description		FLM 501	FLP 501	FLF 501
Mica Paper		Muscovite	Phlogopite	Synthetic
Binder Resin		Silicone	Silicone	Silicone
Thickness		0.2~1.5mm	0.2~2.0mm	0.2~2.0mm
Thickness Tolerance	Average ±	0.02	0.02	0.02
	Individual ±	0.03~0.04	0.03~0.04	0.03~0.04
Density g/cm^2		2.0~2.5	2.0~2.3	2.0~2.2
Mica Content % App.		86~90	86~90	86~90
Compressibility at 200 °C	Under 300 kgf/cm^2	0.5~1.5 %	0.5~1.5 %	0.5~1.0 %
Elastic Compression %		1.0~1.5	1.0~1.5	1.0~1.2
Plastic Deformation %		0.6~1.2	0.6~1.2	0.6~1.0
Punchability		Clean Edge	Clean Edge	Clean Edge
Dielectric Strength kv/mm		> 20	> 25	> 30
Temperature Endurance		550 °C	850 °C	1250 °C

FLEXIBLE PLATE

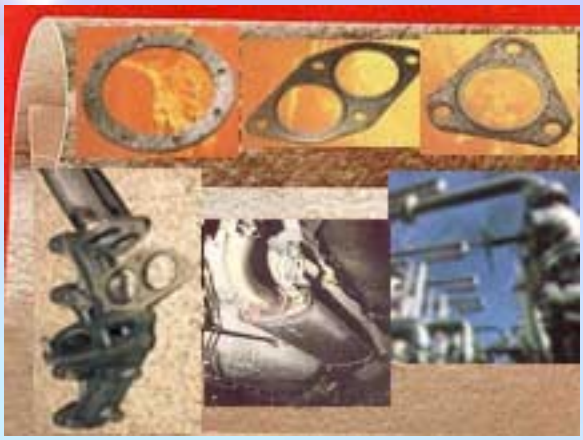
Flexible Plate is processed by stacking mica paper to required thickness and bonded to each other with a desired thermal class thermoplastic resin. It is then set to plate form by applying hot press. The temperature for used binder resin is controlled and maintained to a stable environment and fully cured to form dense and flexible sheets.

Flexible laminates are used for insulation at critical shape places as wrap insulation, separators & layer insulation. It is also used in assembly of flexible heating elements for Hair Driers, Microwave oven etc. as winding cards.

Typical Properties

Description		FLM 501	FLP 501	FLF 501
Mica Paper		Muscovite	Phlogopite	Synthetic
Binder Resin		Silicone	Silicone	Silicone
Thickness		0.2~1.5mm	0.2~2.0mm	0.2~2.0mm
Thickness Tolerance	Average ±	0.02	0.02	0.02
	Individual ±	0.03~0.04	0.03~0.04	0.03~0.04
Density g/cm^2		2.0~2.5	2.0~2.3	2.0~2.2
Mica Content % App.		86~90	86~90	86~90
Compressibility at 200 °C	Under 300 kgf/cm^2	0.5~1.5 %	0.5~1.5 %	0.5~1.0 %
Elastic Compression %		1.0~1.5	1.0~1.5	1.0~1.2
Plastic Deformation %		0.6~1.2	0.6~1.2	0.6~1.0
Punchability		Clean Edge	Clean Edge	Clean Edge
Dielectric Strength kv/mm		> 20	> 25	> 30
Temperature Endurance		550 °C	850 °C	1250 °C

GASKET PLATE



Gasket Plate is processed by stacking mica paper to required thickness and bonded to with silicone resin. It is then set to plate form by applying hot press under stable environment and fully cured to form dense and flexible sheets.

It is 100% incombustible and resistant to tracking and electrical erosion. They possess exceptional dielectric strength, high mechanical modulus, and high chemical resistance and are natural non-toxic product.

Besides other industrial applications, Gasket laminates are used for reproducing high temperature gaskets for use in exhaust system collectors and silencers of automobiles.

Typical Properties

Description		GLM 501	GLP 501	GLF 501
Mica Paper		Muscovite	Phlogopite	Synthetic
Binder Resin		Silicone	Silicone	Silicone
Thickness		0.2~1.5mm	0.2~2.0mm	0.2~2.0mm
Thickness Tolerance	Average ±	0.02	0.02	0.02
	Individual ±	0.03~0.04	0.03~0.04	0.03~0.04
Density g/cm^2		2.0~2.5	2.0~2.3	2.0~2.2
Mica Content % App.		86~90	86~90	86~90
Compressibility at 200 °C	Under 300 kgf/cm^2	0.5~1.5 %	0.5~1.5 %	0.5~1.0 %
Elastic Compression %		1.0~1.5	1.0~1.5	1.0~1.2
Plastic Deformation %		0.6~1.2	0.6~1.2	0.6~1.0
Punchability		Clean Edge	Clean Edge	Clean Edge
Dielectric Strength kv/mm		> 20	> 25	> 30
Temperature Endurance		550 °C	850 °C	1250 °C

REINFORCED PLATE

Reinforced Plate is processed by stacking mica paper to desired thickness and bonded to each other with a high temperature resisting resins on glass cloth reinforcement. It is then set to sheet form by applying hot press. The used binder resin is controlled to maintain a stable and fully cured state to for rigid and dense plates and semi cured state (B Stage) to form dense and flexible sheets.

Major applications of the material are to wrapping material for crucible winding boards, as a protective barrier during the sintering of crucible obtained by the introduction of molten metal, insulation covering in transformer and coil.

Typical Properties

Description		RLM 501	RLP 501	RLF 501
Mica Paper		Muscovite	Phlogopite	Synthetic
Binder Resin		Silicone	Silicone	Silicone
Thickness		0.2~1.5mm	0.2~5.0mm	0.2~5.0mm
Thickness Tolerance	Average ±	0.02	0.02	0.02
	Individual ±	0.03~0.04	0.03~0.04	0.03~0.04
Density g/cm^2		2.0~2.5	2.0~2.3	2.0~2.2
Mica Content % App.		86~90	86~90	86~90
Compressibility at 200 °C	Under 300 kgf/cm^2	0.5~1.5 %	0.5~1.5 %	0.5~1.0 %
Elastic Compression %		1.0~1.5	1.0~1.5	1.0~1.2
Plastic Deformation %		0.6~1.2	0.6~1.2	0.6~1.0
Punchability		Clean Edge	Clean Edge	Clean Edge
Dielectric Strength kv/mm		> 20	> 25	> 30
Temperature Endurance		550 °C	850 °C	1250 °C

INSULATING TAPE

Paper Mica tape is processed by stacking mica paper to desired thickness and bonded to each other with a high temperature resisting resins on glass cloth reinforcement backing material. It is then set to sheet form by applying hot press being passed through heated rollers. They are produced in rolls and slitted to required width.

When the applied layers of Mica Paper Tape are subjected to heat and pressure, the resin flows before gelling and then curing to give a sealed flexible structure of high dielectric and mechanical strength. Major applications of the material are cable, motor, and transformer layer insulation.

Description		Unit	Muscovite	Phlogopite	Synthetic
Thickness		mm	0.12 ~ 0.18	0.12 ~ 0.18	0.12 ~ 0.18
Av. Thick. Tolerance		mm	+0.02	+0.02	+0.02
Weight Approx		g/m^2	165 ~ 265	165 ~ 265	165 ~ 265
Mica Content		g/m^2	120 ~ 160	120 ~ 160	120 ~ 160
Glass Cloth Content		g/m^2	28 ~ 56	28 ~ 56	28 ~ 56
Binder Content		%	10 ~ 14	10 ~ 14	10 ~ 14
Volatile Content		%	1	1	1
Tensile Strength		N/cm	60	60	60
Flexibility		mm	1.5-3.5	1.5-3.5	1.5-3.5
Dielectric Strength	Average	Kv /mm	13-18	15- 20	20 - 25
	Minimum	Kv /mm	10	15	20
Volume resistance		Ω cm	1×10^{10}	1×10^{10}	1×10^{10}
Flame-Resistance		At 600V	90 Minutes	110 Minutes	150 Minutes
Temperature		°C	550	850	1250
Rewinding Property			No false adhesions.		
Bonding Property			No separation of Mica Foil.		

FORMED PARTS

Mica Paper Formed parts are produced by hot forming the Molding Mica Laminates with special moulds in any shape or size Customized to specific drawings.

Major applications in insulation of Grid and rheostat rods, railway and induction-motor brush holder stud, collector stud, carbon-brush supports, conductor bars, slot linings of any cross-section, collar, Commutator sleeves, dry bushing, slip- ring lead, resistance box, X-ray equipment, panel, bush bar, high potential rod and terminal, furnace, switchgear, circuit breaker, transformer, E.O.T. crane and trolley, metallic pivots etc. They are also used as spacer, support and bushes of electrical resistance in electro domestic and industrial equipments and heavy loaded machines.

Typical Properties

Description		MLM 502	MLP 502	MLF 502
Mica Paper		Muscovite	Phlogopite	Synthetic
Binder Resin		Silicone	Silicone	Silicone
Thickness		0.2~1.5mm	0.2~5.0mm	0.2~5.0mm
Thickness Tolerance	Average ±	0.02	0.02	0.02
	Individual ±	0.03~0.04	0.03~0.04	0.03~0.04
Density g/cm^2		2.0~2.5	2.0~2.3	2.0~2.2
Mica Content % App.		86~90	86~90	86~90
Compressibility	< 300 kgf/cm^2	0.5~1.5 %	0.5~1.5 %	0.5~1.0 %
Elastic Compression %		1.0~1.5	1.0~1.5	1.0~1.2
Plastic Deformation %		0.6~1.2	0.6~1.2	0.6~1.0
Punchability		Clean Edge	Clean Edge	Clean Edge
Dielectric Strength kv/mm		> 20	> 25	> 30
Temperature Endurance		550 °C	850 °C	1250 °C

FABRICATED PARTS

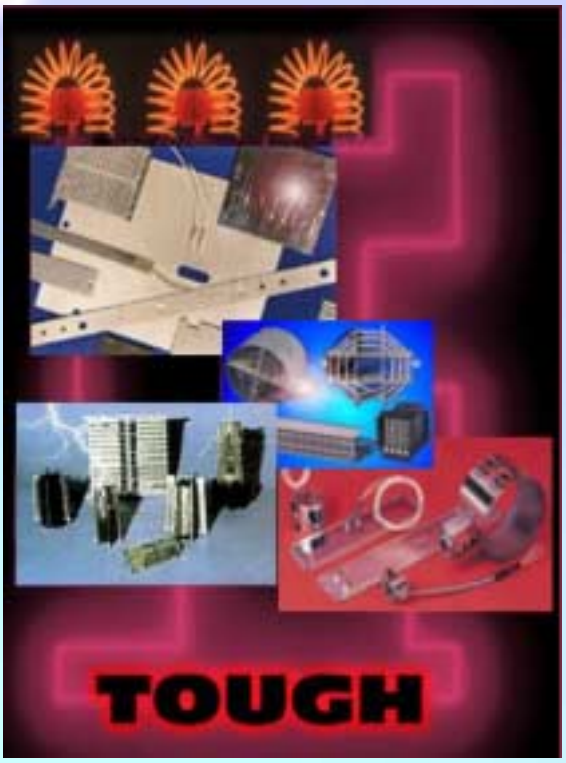
Paper Micanite Plate Punched Parts are produced by machining, shearing, stamping, or punching Heater Plate, Segment Plate, Punching Plate, Gasket Plate, Molding Plate, Reinforced Plate or Flexible Plate in any shape or size fully Customized to specific drawings. Critical shape and designs can easily be accommodated.

It is mainly used as insulating Barrier, Insert, Washer, Disc, Wire Winding Card, Cover Plate etc.

Typical Properties

Description		MLM 502	MLP 502	MLF 502
Mica Paper		Muscovite	Phlogopite	Synthetic
Binder Resin		Silicone	Silicone	Silicone
Thickness		0.2~100mm	0.2~100mm	0.2~100mm
Thickness Tolerance	Average ±	0. 02	0.02	0.02
	Individual ±	0.03~0.04	0.03~0.04	0.03~0.04
Density g/cm^2		2.0~2.5	2.0~2.3	2.0~2.2
Mica Content % App.		86~90	86~90	86~90
Compressibility at 200 °C	Under 300 kgf/cm^2	0.5~1.5 %	0.5~1.5 %	0.5~1.0 %
Elastic Compression %		1.0~1.5	1.0~1.5	1.0~1.2
Plastic Deformation %		0.6~1.2	0.6~1.2	0.6~1.0
Punchability		Clean Edge	Clean Edge	Clean Edge
Dielectric Strength kv/mm		> 20	> 25	> 30
Temperature Endurance		550 °C	850 °C	1250 °C

HEATING ELEMENT



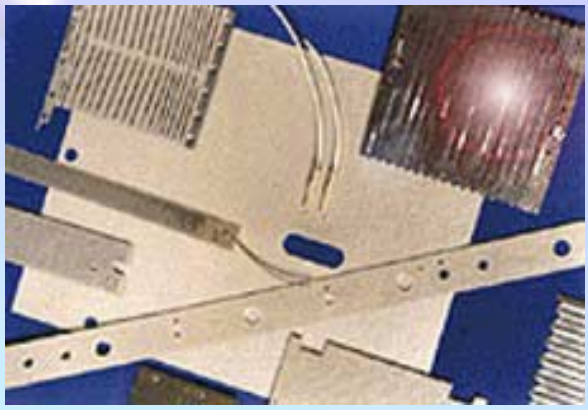
Mica insulated heaters are constructed of nickel-chrome resistance wire wound uniformly around the mica winding card and insulated by select quality mica either natural Muscovite or Heat Resistant Paper Micanite, for a maximum operating temperature of 550 °C. The main function of mica for the above applications is to support and separate heating elements and nickel-chrome resistance wire. To ensure trouble free operations, the resistance ribbon joints and terminals are either spot welded or riveted as and where required. Nickel plated eyelets are used as & where needed.

Mica insulated heaters offer a cost-effective approach for all types of heating applications because the mica construction provides for an extremely rugged heater with thermal efficiency of over 87%.

The low mass of the mica-insulated heater allows rapid heat-up and cool down thus respond rapidly to control and operate at high efficiency. The heat generated by the element in a mica-insulated heater is spread over a larger surface area which by lowering element temperature therefore gives longer lifetime of element.

Tough designs and manufactures custom mica insulated heaters with greater design flexibility. Requirements for size, wattage and voltage specifications can be precisely met with a custom designed heater. Tough has a proven track record of excellent customer service and on-time delivery.

SURFACE HEATER



Surface Heater essentially consist of three pieces of natural or Heat Resisting Micanite sheet cut or punched to a specified shape conforming to the bottom plate. The upper and bottom sheets or cover are used for insulation purposes to support and separate the mica wire winding card which is placed in the middle and is wound with a specific gauge of high grade nickel-chrome resistance ribbon wire providing even heat distribution to the flat surface and maximum heating life to the element under severe heat encountered in the service. These heating elements for surface heating applications are custom-built to fit different configurations in electric ratings ranging from 150 to 3000 watts, suitable to operate at 110/120 and 220/230 volt circuits.

Customized mounting holes are provided for easy installation. Irregular shapes are easily accommodated. Uniform heating is provided over the entire heater surface. For applications requiring heat concentrations in specific areas, the element is profiled to match the pattern.

Mica surface heaters are the most reliable and efficient heating solutions for tanks, platens and other surface heating applications, freeze and moisture protection in control cabinets, and infinite other industrial and commercial applications.

We can design or produce customized heaters exactly as per your drawings or samples and supply the perfect heat source for any surface heater application.

BAND HEATER

Rugged construction along with high temperature and high watt density capabilities allow the Mica Band Heater to surpass all other band heaters in providing the ever increasing temperatures required for processing today's high tech materials.

Mica-insulated band heaters have proved themselves to be a reliable insulation for heating the barrels and nozzles of plastic molding and extruding machines to perform at higher operating temperatures up to 1200 °F (650 °C), providing long, efficient and dependable service life necessary for today’s high productivity of plastic extruders, injection and blow molding machines, autoclaves, heating pipes, barrels and a wide range of cylinder-heating applications. They are constructed by winding a high quality nickel-chromium ribbon wound around a selected grade of sheet mica having an excellent dielectric and mechanical strength, as well as, thermo-conductivity, sandwiching the resistance element between two other mica sheets, and then folding sheet-metal around the sandwich to the desired circular shape. Mica type band heaters are constructed in either one or two piece configurations using a claming straps for easy installation by slipping the heater over the cylinder and tightening the single clamping screw to provide optimum contact throughout the operating range.

The connection systems employed are either plug pins, screw type terminals, or twin leads, insulated internally and externally with mica washers, serviced with porcelain beads or fiber-glass sleeving designed for long trouble-free service life.

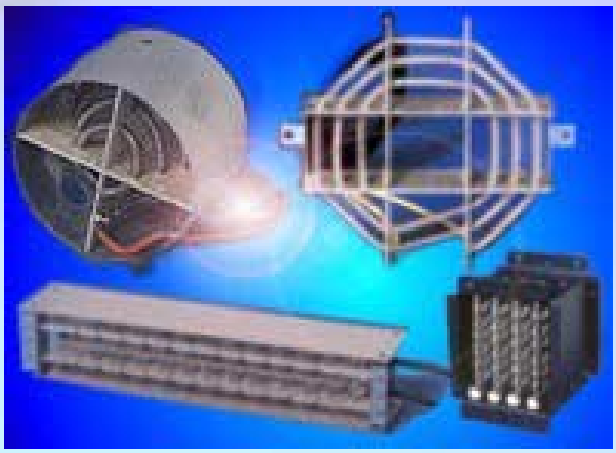
STRIP HEATER

Mica-insulated strip heaters have proven to be an economical, practical and reliable heat source, capable of providing uniform heat transfer to flat surfaces, retaining good heater life, with ability to operate at higher temperature with continuous operating temperature rating of 1200 °F (650 °C) with maximum efficiency. They are manufactured in any desired width and length ranging from 1 to 18 inches width, by 1.1/2 to 60 inches lengths, by 1/8 inch thick, using nickel-chromium ribbon wire evenly space wound on a specially selected mica strips, enclosed in a rust-resistant steel sheath casing, as per customers' requirements, with terminal at one or both ends with or without mounting holes. They are clamped securely along their entire length to a smooth metal surface to prevent distortion or unequal expansion.

They are manufactured for electric rating ranging from 050 to 2000 watts and to operate at 115 and 220 volt circuits. Strip or finned heaters are used for process machine, dies, molds, tanks, kettles, cylinders or other applications where con- trolled heating is needed. Typical applications are blow molding equipment, food warming equipment, platens in hydraulic presses, incubators, plastic molds, hot plates, ovens, testing equipment, vulcanizing presses, vending machines and hundreds of industrial heating applications.

We can supply the perfect heat source for any strip heater application.

OPEN COIL HEATER



An air heater with an open-coil element maximizes the exposure of the element to the air. This increases the efficiency of heat exchange. Response times are very fast, providing for rapid heat up and cool down times. You get the exact heater you need - not a compromise

These heaters are easy-to-install and mount directly to square axial fans, using the same mounting holes as for the fan itself. These air heaters utilize multi-purpose mounting brackets to attach directly to the exhaust of a cross flow blower without the need for additional accessories. These heaters mount directly to square axial fans, using the same mounting holes as for the fan.

These standard heaters are available in several sizes, a broad range of wattages, and with custom features. They are ideal for a wide range of drying, curing and warming applications typically found in film processing, lab and medical instruments.

These cross flow blower heaters may be tailored to meet your specific heating requirements. Size, wattage, and voltage may be matched to your specifications for optimal system performance.

The open-coil element has an extremely fast response time and efficiently transfers heat to the moving air. Wattage and voltages are easily changed to meet your specifications.

Our experienced engineers can begin involvement at any stage of development. We'll assist with design approaches, supply prototype samples, and offer cost-reduction suggestions.

FLEXIBLE HEATER

A fine gauge resistance wire is spiraled around a core produced with mica and fiberglass combination bonded with high temperature resisting silicone resin. The element is placed in a specifically designed pattern of Glass Fabric & Mica Paper combination plates and optionally vulcanized to a silicone rubber substrate. Advantages versus etched foil elements are: Physical strength; flexibility; smaller production quantity; conforms well to small radius bends and larger possible sizes.

The Heaters are rugged, moisture and chemically resistant and are easily bonded or cemented to heat sinks or other parts to be heated. Temperatures up to 300°C and up to 20 watts per square inch are easily accommodated. The thin profile transfers heat quickly because the actual resistance element is so close to the heated part. These Heaters can be insulated with silicone sponge rubber bonded to one side. Another way to lower radiated and convected heat losses is to apply an aluminized surface to the heater back.

These heaters are particularly suited to critical oval, elliptical or round shape heating areas where several opening and closing takes place during operation cycle like Mug Transfer Presses.

We can produce and assemble the complete heater assembly with spring steel support sheaths and other hardware as per drawings and specifications required in application.

APPLIANCE HEATER

Mica heating elements are assembled from natural fabricated mica former or Reconstituted Heater Plates suitable for all types of domestic and Industrial Appliances. They provide excellent heat, thermal & flame insulation properties. Patterns and dimensions are precisely customized as per customer's drawings.

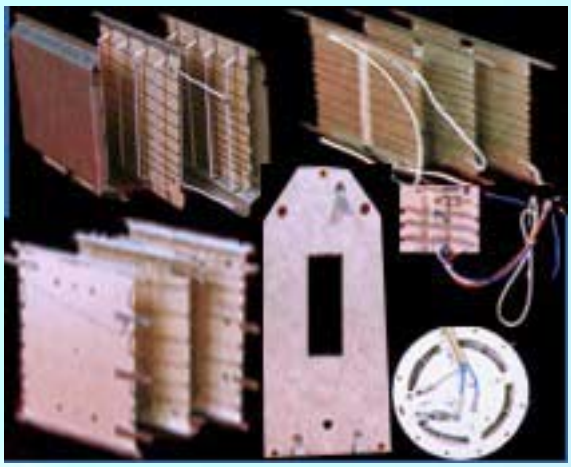
Mica Blocks Cards

- High Quality Ni-chrome Wire.
- Fabricated Ruby Mica Former.

Paper Micanite Rigid Cards

- High quality Ni-chrome Wire
- Muscovite Paper Heater Laminate.

Mica Heating elements are the best selections for long lasting and most hygienic components used for Domestic appliances as:



- Flat Iron
- Bread Toaster
- Electric Kettle & Oven
- Electric Pop-corner
- Hair Driers
- Hot Plates & Milk Warmer
- Hot Air Blower
- Coffee Percolator
- Rice Cooker

All Mica heaters are customized as per customer's drawings to meet their specifications precisely. Optionally with bread guides and heat reflectors.