



radiant@radiantad.com • June 2014



Ruby Mica®

INSULATION LAMINATES

For High Heat & Voltage Applications



Ruby Mica®

RUBY MICA COMPANY LTD.

Corporate Office :

Barganda, Old LIC Office Building, Giridih 815 301, Jharkhand, India

P : +91 6532 222357 / 2957 / 1057, F : +91 6532 222857, E : info@rubymica.com

Works :

Vill. Chatro. P.O. Gadi Srirampur, Giridih: 815 301, Jharkhand, India

www.rubymica.com

About us

Ruby Mica Co. Ltd. was established in 1968 for manufacturing the highest quality mica-based electro-thermal insulating materials catering to various industrial applications globally. Armed with over 45 years of experience, we have continuously evolved in accordance to the dynamic market needs for innovative insulation solutions, including insulating laminates for high heat and voltage applications. Our state-of-the-art, fully-integrated manufacturing facility affords us complete control over the manufacturing process, right from the product conceptualization phase to micro-product developmental stage, leading to ultimate customer satisfaction.

We strongly believe that good ingredients make a great end-product; hence we start by manufacturing the highest-grade of mica paper ourselves and laminating them using world-renowned binding resins that keep product-aging in check besides granting them a longer shelf-life.

Vision

Adding value to the intrinsic properties of mica with innovative technology and processes to enable our customers manufacture superior products that make the world a better and safer place to live in.

Mission

To be the recognized performance-leader in the mica-manufacturing industry by achieving profitable growth through operational excellence, innovation, quality and commitment to customer service.



MICA

Mica is gifted with exceptional values; it possesses some of the most outstanding combination of physical, electrical, thermal, mechanical and chemical properties that are not found in any other product.

Physical Properties

All mica form flat six-sided mono-clinical crystals with a remarkable cleavage in the direction of large surfaces, which permits them to easily split into optically-flat films. Mica is transparent, colourless in thin sheets, resilient and incompressible.

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-coefficient and capacitance. It is noted for its resistance to arc and corona discharge with no permanent injury and maintains its dielectric properties when exposed to the oxidizing action of electrical discharges either on the surface or within internal gas spaces in built-up mica insulation.

Thermal Properties

Mica is fire-proof, infusible, incombustible and non-flammable and can resist temperatures of 600°C to 900°C (1112°F to 1652°F) depending on the variety. It has low heat-conductivity, excellent thermal-stability, and may be exposed to high temperatures without noticeable effect.

Mechanical Properties

Mica is relatively soft and can be hand-cut, machined or die-punched. It is flexible, elastic and tough, having high tensile strength. It can withstand great mechanical pressure perpendicular to plane but the lamination has cleavage and can be easily split into very thin leaves. When split into thin films, they remain tough and elastic, even at high temperature.

Chemical Properties

Mica is a complex hydrous silicate of aluminium 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 hydro-fluoric and concentrated sulphuric) alkalis, conventional solvents, oils, and is virtually unaffected by atmospheric action.



Mica Blocks

Bihar Classification of Qualities of Block Mica

Grading of Mica According to Area

Madras Classification of Qualities of Block Mica

Superfine
Clear & slightly Stained
Fair Stained
Good Stained
Stained
Heavily Stained
Densely Stained
Spotted 1st Quality
Spotted 2nd Quality

Grades

Over over Ex Ex Sp.
Over Ex Ex Sp.
Ex Ex Spl.
Ex Spl.
Special
No. 1
No. 2
No. 3
No. 4
No. 5
No. 5½
No. 6
No. 7

Alternative description

100 up
Over over Ex Spl.
Over Ex Spl.
Ex Spl.
Special
No. 1
No. 2
No. 3
No. 4
No. 5
No. 5½
No. 6
No. 7

Area in Sq. Inches

100 & over
80 - 100
64 - 80
48 - 64
36 - 48
24 - 36
15 - 24
10 - 15
6 - 10
3 - 6
2¼ - 3
1 - 2¼
below 1

Clear Green 1st
Clear Green 2nd
Green B.Q.
Ruby A.Q.
Ruby B.Q.
Spotted 1st Quality
Spotted 2nd Quality

N.B. For simplification in classification Clear Green 1st and 2nd are usually described as either Green Clear II of just Green Clear whilst Green B.Q. is shown separately

Generalized properties of natural mica

PROPERTIES	RUBY MICA	AMBER MICA
Trade description	MUSCOVITE	PHLOGOPITE
Chemical composition Less water of constitution	H ₂ KAl ₃ (SiO ₄) ₃	H ₂ KMg ₃ Al(SiO ₄) ₃
Sources	India, U.S., S. America, Africa	Canada, Madagascar
Colour	Brown, Yellow, Green	Yellow to Dark Green
Sp. Gr.	2.6 to 3.2	2.6 to 3.2
Sp. heat	0.207	0.207
Moh Hardness	2.8 to 3.2	2.5 to 3.0
Shore Hardness	80 to 150	70 to 100
Optic Axial Angle	1,500 to 6,000	5° to 25°
Vol. Resistivity ohm-in	2 × 10 ¹³ to 1 × 10 ¹⁷	Somewhat less than 2 × 10 ¹³ to 1 × 10 ¹⁷
Dielectric Strength [1 to 3 mils. thick in air] volts/mil.	50° to 75°	3,000 to 4,200
Dielectric Constant	6.5 to 8.7	5 to 6
Power Factor [1/Q]	-0001 - -0004	-004 to -07
Max. Coeff. of Expansion, Inches per inch per C.	9 to 12 × 10 ⁻⁶	12 to 15 × 10 ⁻⁶
Modulus of Elasticity [10 mils. thick] lb./sq. in.	About 25 × 10 ⁶	About 25 × 10 ⁶
Water of Constitution	4-5%	3%
Water of Constitution driven off at	600 800°C.	Above 950°C.
Max Temp. of Use	600°C.	Certain varieties 850°C.
Flexibility	Dependent upon quality	Good
Transparency	Good	Not transparent except in very thin films
Acid Reaction	Affected only by Hydrofluoric Acid	Affected only by Sulphuric Acid

INCHES 3

Indian Scale



Mica Flakes

Mica Flakes is mica scrap ground into sizes up to 16 mesh (1190 microns). This is prepared mainly by pulverising in rotary hammer crushing machines till the required size is achieved and the ground-material passes out from the graded sieves attached therein.

Mica Powder

Mica powder is obtained by continuing the pulverisation process till the ground-output reaches mesh sizes of 30 to 325, equivalent to 595-44 microns. The end-use dictates the fineness of the powder.

Classification

Grade	Mesh
Coarse Flakes	2
Medium Coarse Flakes	10
Fine Coarse Flakes	16
Coarse Fine Powder	30
Medium Fine Powder	60
Fine Powder	100
Superfine Powder	325

MICA PAPER

Ruby Mica® Uncalcined Muscovite / Phlogopite Mica Paper is a homogenized form of pure natural mica. It preserves all the desirable characteristics of raw mica, while eliminating imperfections and impurities. It has a high price-advantage over good quality natural mica.

Two grades of mica-paper are available:

- Mechanical grade: Highly-porous mica-paper with excellent impregnating properties.
- Thermo-Mechanical grade: Less porous mica-paper with higher tensile-strength.

Application

Base-material and the most critical ingredient in all high-voltage and high-temperatureresistant insulating products.

Availability

Folium:

Length 400 - 550 m

Width 1000 / 1020 / 1040 mm

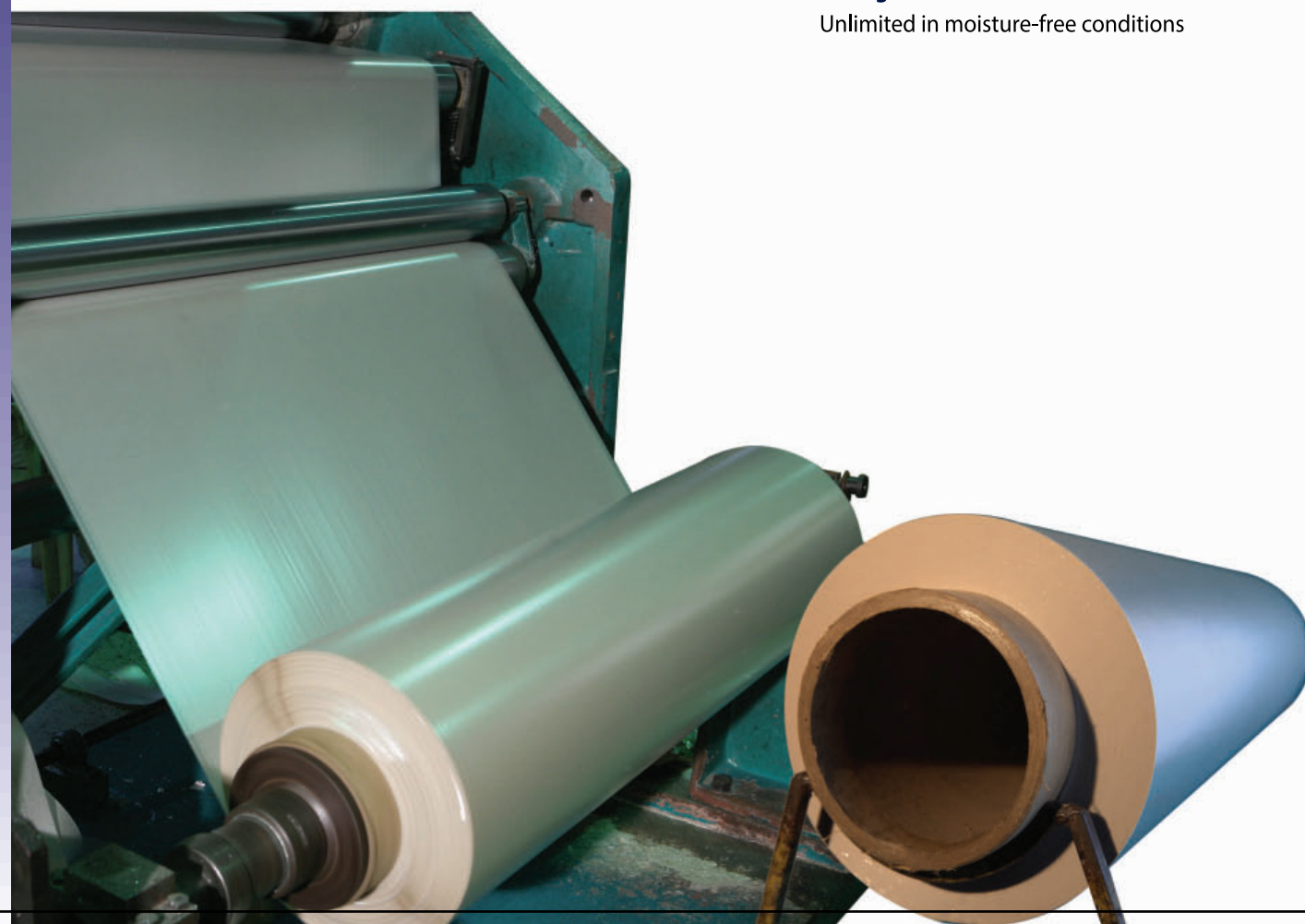
Thickness 60 – 300 GSM

Packing

Mica-paper roll is air-suspended using thick side-pad supports and packed in airtight and robust boxes protecting them from dirt, dust, moisture and shock. The packaging also ensures safe transit and storage.

Storage

Unlimited in moisture-free conditions



Product Data : Uncalcined Muscovite Mica Paper

Type		75 gsm	80 gsm	100 gsm	120 gsm	150 gsm	180 gsm	230 gsm	250 gsm
Basis Weight	gr / m ²	75	80	100	120	150	180	230	250
Max Deviation (Average)	%	± 5	± 5	± 5	± 5	± 5	± 5	± 5	± 5
Max Deviation (Single Value)	%	± 7	± 7	± 7	± 7	± 7	± 7	± 8	± 8
Indicative Thickness Average	mm	0.048	0.05	0.05	0.07	0.09	0.105	0.13	0.145
Tensile Strength (≤)	kN/m	0.35	0.35	0.35	0.35	0.4	0.45	0.45	0.45
Dielectric Strength	kN/mm	15 – 17	15 – 17	15 – 17	15 – 18	15 – 18	15 – 18	15 – 18	15 – 18
Porosity	s/100 ml	500 ± 50	550 ± 50	550 ± 50	550 ± 50	600 ± 50	650 ± 50	800 ± 100	800 ± 100
Penetration Average Value	s	5 ± 2	5 ± 2	7 ± 2	8 ± 2	12 ± 2	20 ± 5	45 ± 10	50 ± 10
Loss of Mass (≤)	%	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Conductivity of Aqueous Extract	μS/cm	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5

Note: 10 N/cm = 1 kN/m

Product Data : Uncalcined Phlogopite Mica Paper

Type		75 gsm	80 gsm	100 gsm	120 gsm	150 gsm	200 gsm	230 gsm	250 gsm	270 gsm
Basis Weight	(gsm)	75	80	100	120	150	200	230	250	270
Max Dviation (Average)	%	± 5	± 5	± 5	± 5	± 5	± 5	± 5	± 5	± 5
Max Deviation (Single Value)	%	± 7	± 7	± 7	± 7	± 7	± 7	± 7	± 7	± 7
Indicative Thickness Average	mm	0.05	0.052	0.063	0.072	0.092	0.12	0.135	0.145	0.155
Tensile Strength (≤)	kN/m	0.3	0.3	0.35	0.4	0.4	0.45	0.45	0.45	0.45
Dielectric Strength	kN/mm	14 ± 16	14 ± 16	14 ± 16	15 ± 17	15 ± 17	15 ± 17	15 ± 18	15 ± 18	15 ± 18
Porosity	s/100 ml	350 ± 50	350 ± 50	350 ± 50	350 ± 50	350 ± 50	600 ± 100	700 ± 100	700 ± 100	700 ± 100
Penetration Average Value	s	4 ± 2	4 ± 2	7 ± 2	8 ± 2	10 ± 4	25 ± 8	30 ± 10	35 ± 10	35 ± 10
Loss of Mass (≤)	%	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Conductivity of Aqueous Extract	μS/cm	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4

Note : 10 N / cm = 1 kN / m

Data is based on test performed by Ruby Mica Co. Users are advised to verify and ensure suitability for intended applications. The above product can be tailored according to your desired specifications.



RIGID MICA LAMINATE

Ruby Mica® Rigid Mica Laminate is made by combining uncalcined muscovite or phlogopite mica-paper with an inorganic silicone-resin binder under specific heat and pressure.

It has excellent rigidity, heat-resistance, moisture-resistance and di-electric properties. It is a completely asbestos-free and highly chemical-resistant insulation having low thermal-conductivity. It does not emit smoke or odor upon heating up. Since the binder plays a critical role in the overall product performance, the best commercially-available resin, with as much as 82% solid silicone content, is imported from Germany for excellent results.

Muscovite mica paper-based material can withstand temperatures up to 600°C whereas, phlogopite mica paper-based material can withstand high temperatures up to 800°C. The product is IEC 60371-3-3 compliant.

A choice of epoxy resin is also available as a binder. **Ruby Mica® Epoxy Rigid Mica Laminates** have higher rigidity, highly-uniform surface profile and weatherproof properties when fully cured. However, the working temperature is limited to 250°C – 300°C. They are mainly used for commutator-segment insulation.

Application

Heating-element supports, winding-cards and cover-plate insulation in domestic appliances and industrial-heating elements. Its superior chemical-resistance makes it an ideal battery-cell separator. Highly temperature-resistant mica machined parts for complete Ferro alloys submerged arc furnace and induction furnace insulation. Dynamic breaking resistors in railways and plate-insulation in heated presses. Thermocouples and conductor insulation.

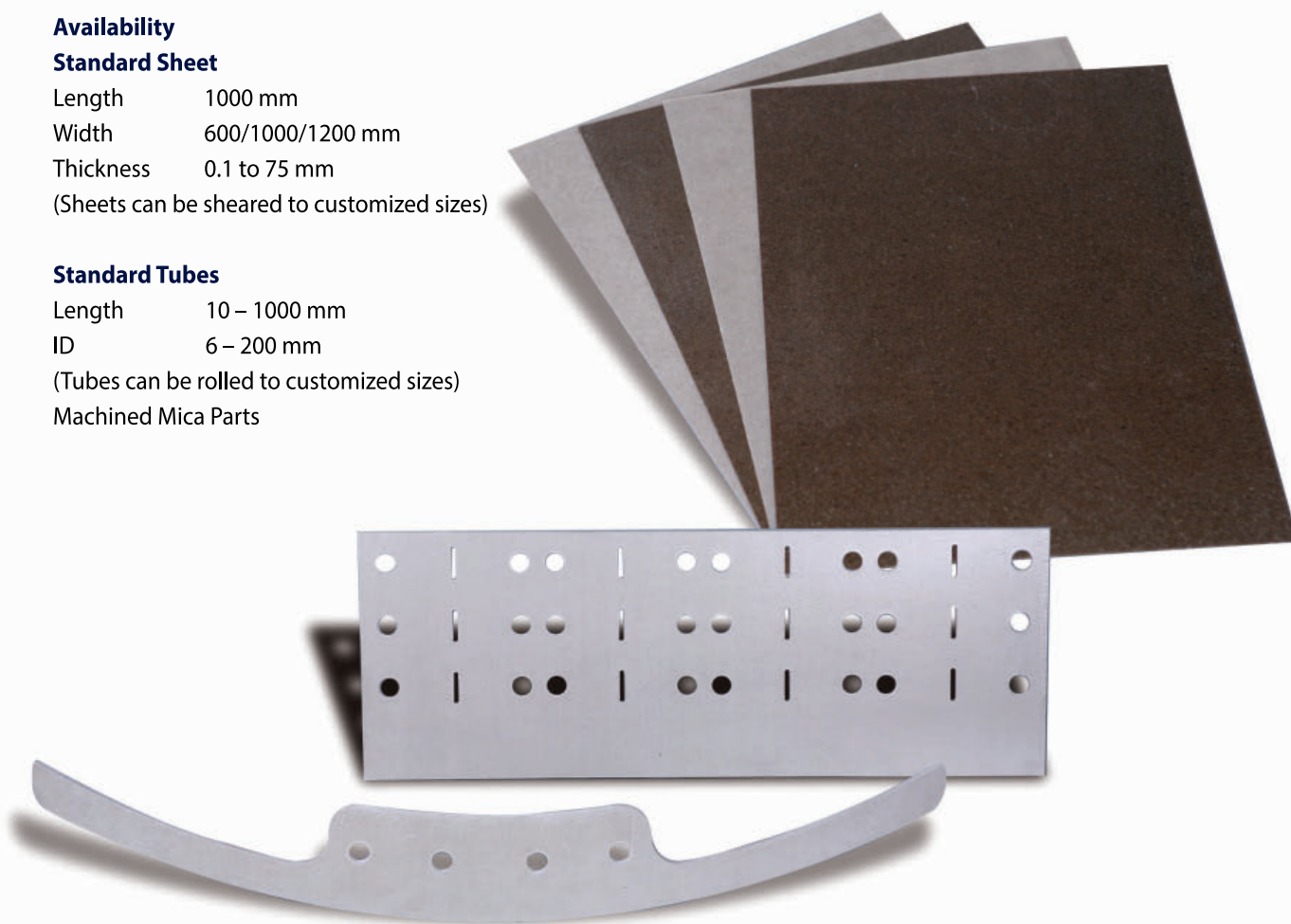
Availability

Standard Sheet

Length 1000 mm
Width 600/1000/1200 mm
Thickness 0.1 to 75 mm
(Sheets can be sheared to customized sizes)

Standard Tubes

Length 10 – 1000 mm
ID 6 – 200 mm
(Tubes can be rolled to customized sizes)
Machined Mica Parts



Rigid Mica Washers and Laminates can be custom machined to desired component drawings at our facilities.

Packing

Sheets/tubes/mica machined parts are packed in airtight robust wooden boxes protecting them from dirt, dust and moisture. The packaging also ensures safe transit and storage.

Storage

12 months at ≤ 25°C

Product Data

Material		
Mica	%	90
Silicone	%	10

Mechanical

Density	g/cm ³	2.3 ± 0.1
Tensile strength	MPa	> 150
Flexural strength	MPa	> 230
Compressive strength	MPa	> 400

Electrical

Dielectric strength	kV/mm	> 25
---------------------	-------	------

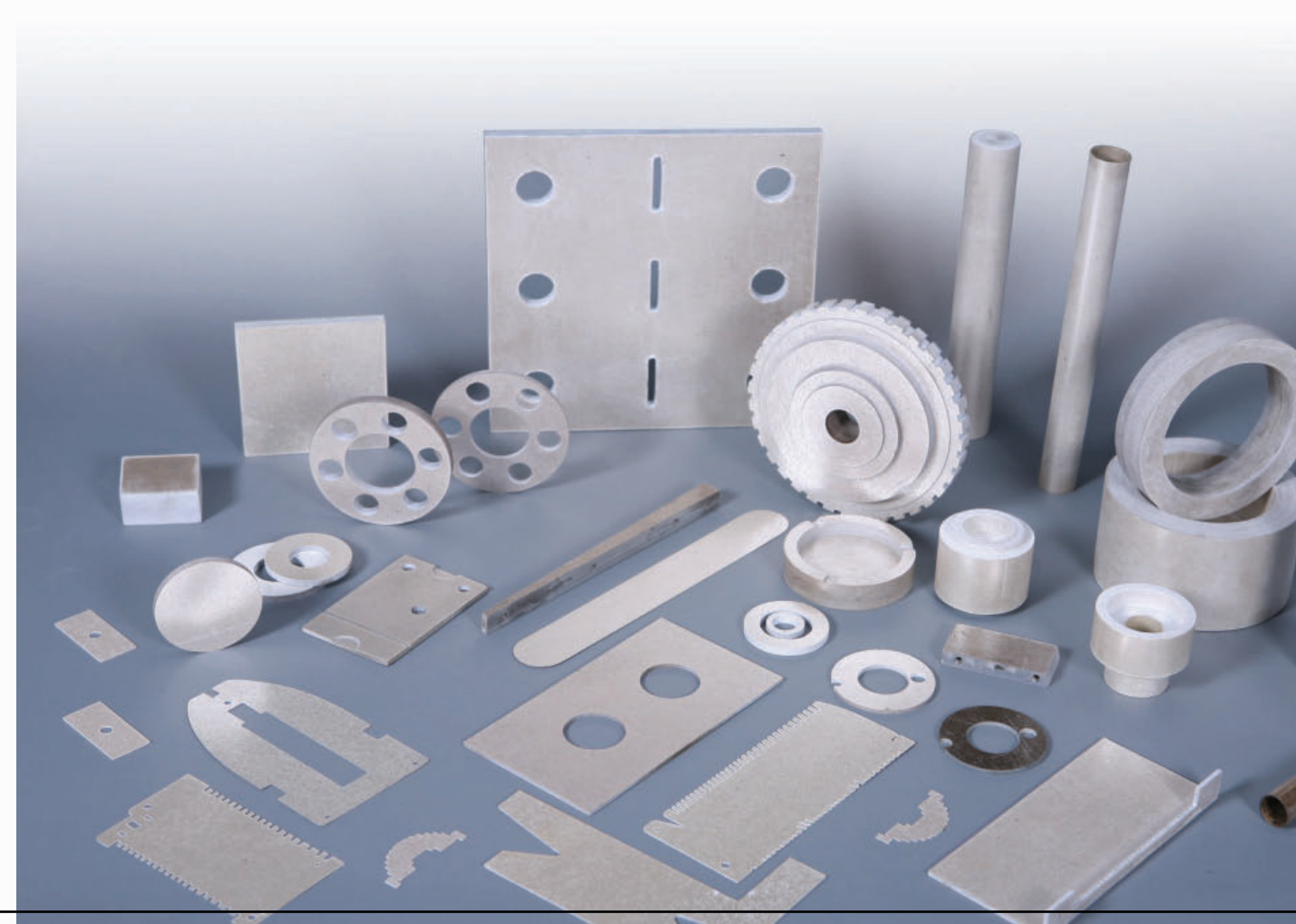
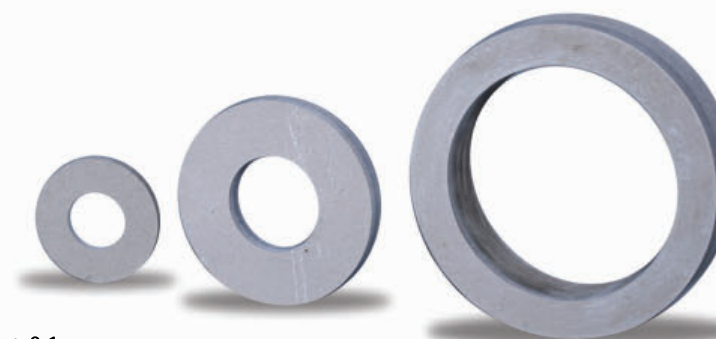
Thermal

Operating temperature	°C	500 – 600 (M) 700 – 800 (P)
-----------------------	----	--------------------------------

Other

Weight loss	%	< 0.5
Water absorption	%	< 0.2

Data is based on test performed by Ruby Mica Co. Users are advised to verify and ensure suitability for intended applications. The above product can be tailored according to your desired specifications.



FLEXIBLE MICA LAMINATE



Ruby Mica® Flexible Mica Laminate is made by combining uncalcined muscovite or phlogopite mica paper with an inorganic silicone resin binder under specific heat and pressure.

It has excellent flexibility, heat resistance, moisture resistance and di-electric properties. It is a completely asbestos-free and highly chemical-resistant insulation having low thermal-conductivity. It does not emit smoke or odor upon heating up.

Muscovite mica paper-based material can withstand temperatures up to 600° C whereas, phlogopite mica paper-based material can withstand high temperatures up to 800° C. The product is IEC 60371-3-3 compliant. Flexible mica laminates can also be made using a B-Stage Epoxy resin as a binder. These sheets have excellent adherence to metal surfaces.

Application

Filling voids and unevenness in conductor bunches, roebel bars. High temperature resistant gaskets, hollow spaces and cavities in electrical machines.

Availability

Standard Sheet:

Length 1000 mm
Width 600/1000/1200 mm
Thickness 0.1 to 3 mm
(Sheets can be sheared to customized sizes)

Packing

Sheets are packed in airtight mechanically strong wooden boxes protecting them from dirt, dust and moisture. The packaging also ensures safe transit and storage.

Storage

6 months at ≤ 25°C
12 months at ≤ 5°C

Product Data

Material		
Mica	%	80
Silicone	%	20

Mechanical

Density	g/cm ³	2.1 ± 0.1
Tensile Strength	MPa	> 25
Compression	%	< 20

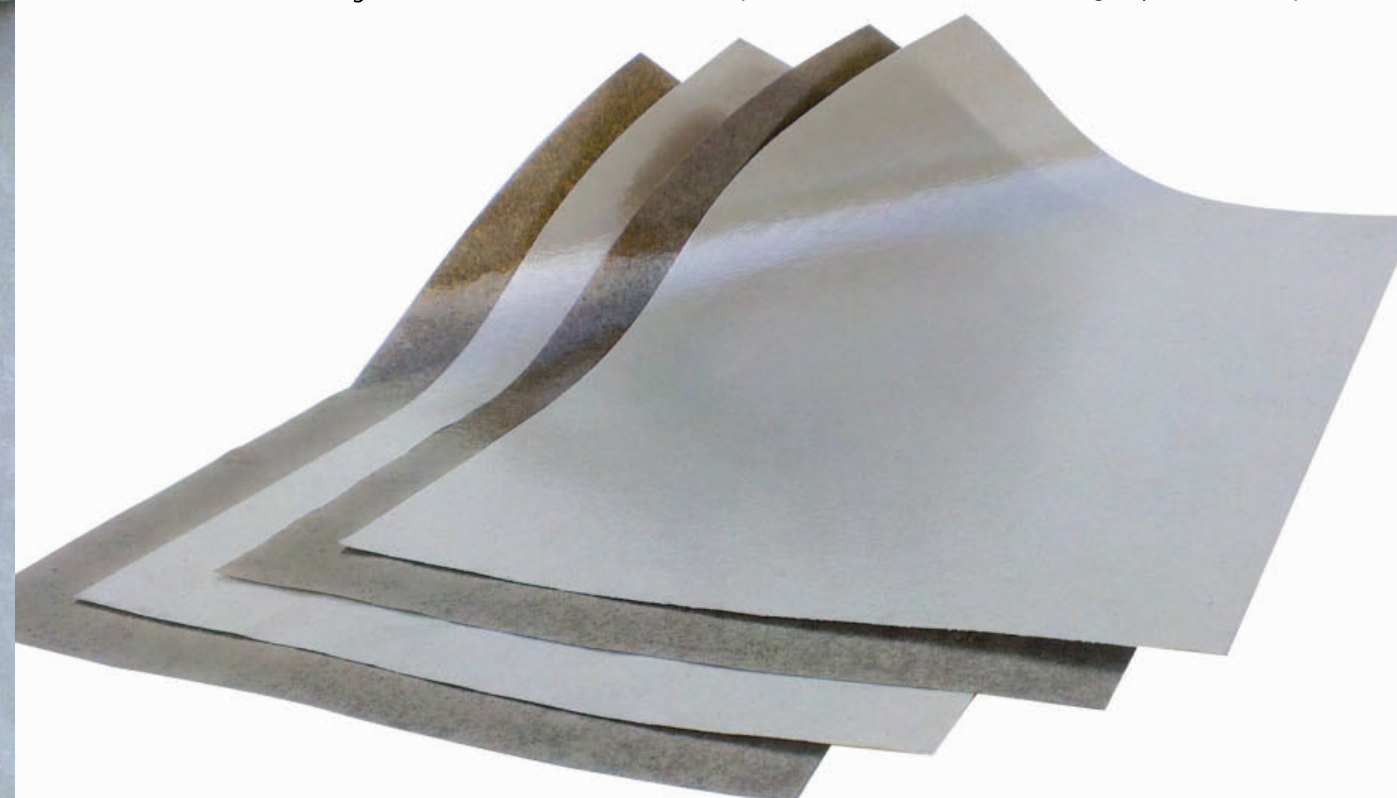
Electrical

Dielectric Strength	kV/mm	> 20
---------------------	-------	------

Other

Weight Loss	%	< 0.5
Water Absorption	%	< 0.2

Data is based on test performed by Ruby Mica Co. Users are advised to verify and ensure suitability for intended applications. The above product can be tailored according to your desired specifications.



FIBERGLASS COMPOSITES



Ruby Mica® Epoxy /Silicone Bonded Fiber Glass Composites are made by combining glass cloth with an epoxy/silicone resin as a binder, cured under specific heat and pressure. It has excellent rigidity, heat-resistance, moisture-resistance and di-electric properties. It is a completely asbestos-free and highly chemical-resistant insulation having low thermal-conductivity. It does not emit smoke or odor upon heating up. Epoxy-based composites can withstand temperatures up to 250 - 300° C, whereas silicone-bonded composites can withstand temperatures up to 350 - 450° C.

Application

Highly temperature-resistant composite machined-parts for Ferro alloys submerged arc furnace and induction furnace insulation.

Slot packing insulation in HT motors, high-temperature washers in lifting magnets, etc.

Availability

Standard Sheet

Length	1000 mm
Width	600/1000/1200 mm
Thickness	0.1 to 50 mm
(Sheets can be sheared to customized sizes)	

Standard Tubes

Length	10 – 1000 mm
ID	6 – 200 mm
(Tubes can be rolled to customized sizes)	
Machined Composite Parts	

Product Data

Material

Fiber glass cloth	%	70 ± 5
Epoxy resin	%	30 ± 5
Fiber glass cloth	%	80 ± 5
Silicone resin	%	20 ± 5

Mechanical

Density	g/cm ³	1.9 ± 0.5
Tensile strength	MPa	> 275
Flexural strength	MPa	> 230
Compressive strength	MPa	> 400

Electrical

Dielectric strength	kV/mm	> 30
---------------------	-------	------

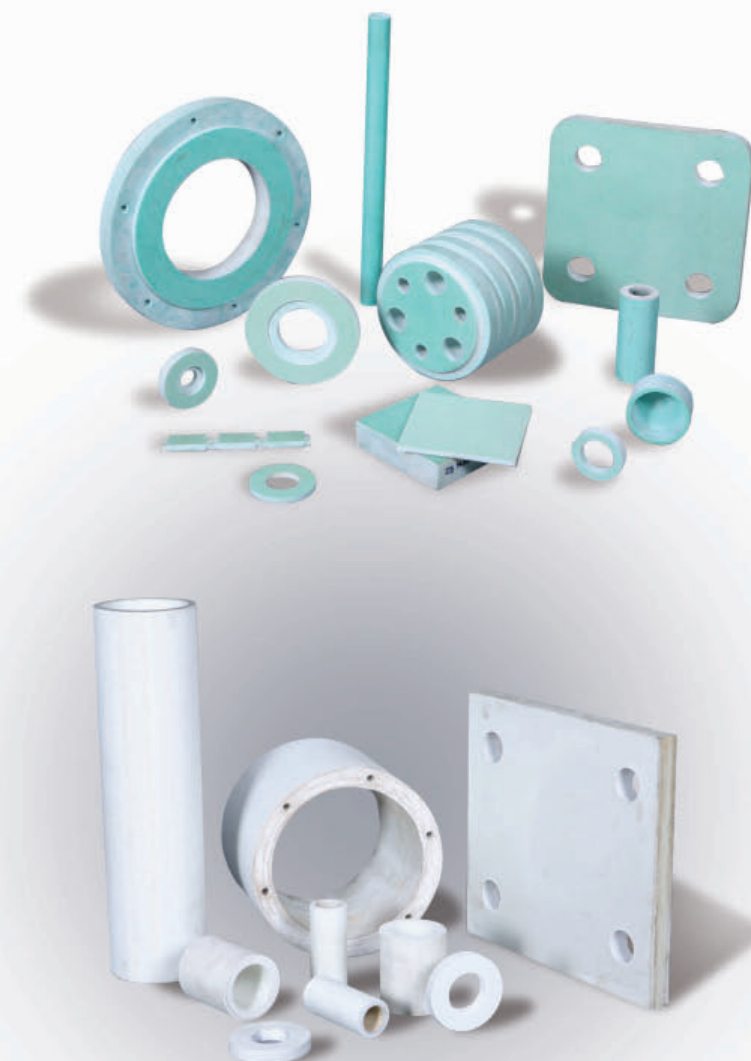
Thermal

Operating Temperature	° C	250 – 300 (Epoxy)
		350 – 450 (Silicone)

Other

Weight Loss	%	< 0.5
Water Absorption	%	< 0.1

Data is based on test performed by Ruby Mica Co. Users are advised to verify and ensure suitability for intended applications. The above product can be tailored according to your desired specifications.



GLASS / MICA FOLIUM



Ruby Mica® Glass / Mica Folium is a lamination of uncalcined phlogopite mica paper with a glass cloth. High thermal-grade silicone resin is used as a binder. This highly-flexible material can easily withstand temperatures to the tune of 950° C.

Higher temperature-endurance of 1200° C can be achieved by laminating an additional backing of ceramic-felt on the glass cloth side making it a Mica/Glass/Ceramic Folium.

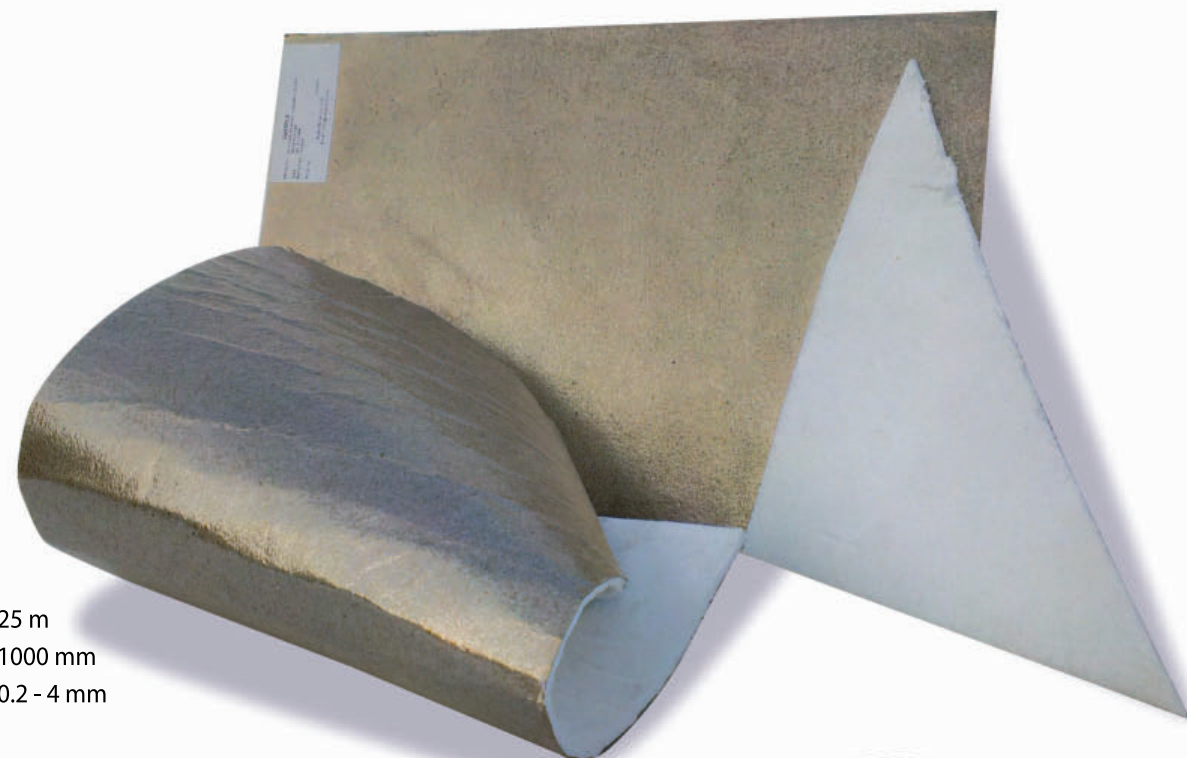
These do not emit any smoke or odor upon heating up. They have excellent electrical-resistance and high thermal-conductivity increasing the overall efficiency of the furnace.

Application

Slip-plane insulation in furnaces protecting the coil and high-temperature resistant refractory linings and relining of crucible furnaces. Apart from providing electrical and thermal insulation it also acts as a gas-diffusion barrier.

Mica is an excellent substitute for asbestos due to its many working-environment health-benefits and green biodegradable properties. Mica ensures maximum worker safety and greatly reduces the furnace down time due to the accumulated sintered mass.

GLASS / MICA FOLIUM



Availability

Length	25 m
Width	1000 mm
Thickness	0.2 - 4 mm

Packing

Folium is packed in airtight robust boxes protecting them from dirt, dust and moisture. The packaging also ensures safe transit and storage.

Storage

12 months at 20° C

Product Data

Properties	Test Method	Unit	Value
Total Substance	IEC 60371 - 2	g/m ²	634 ± 16
Mica Paper	IEC 60371 - 2	%	71
Glass Content	IEC 60371 - 2	%	15
Resin Content	IEC 60371 - 2	%	14
Nominal Thickness	IEC 60371 - 2	mm	0.4 ± 0.01
Tensile Strength	IEC 60371 - 2	N/cm	≤ 160
Stiffness	IEC 60371 - 2	N/m	≤ 55
Breakdown Voltage	IEC 60243 - 1	kV	≤ 4

Data is based on test performed by Ruby Mica Co. Users are advised to verify and ensure suitability for intended applications. The above product can be tailored according to your desired specifications.



HEATING ELEMENTS

This special product showcases the essence of full facility-integration. The development starts with the manufacture of a high-grade, uncalcined mica paper at our works. The mica paper is then used to manufacture both thermally and electrically-sound and robust laminates. These laminates are then trimmed and punched into a former based on the customers design. In the meantime, 80/20 Nickel Chromium alloy resistance heating wire is drawn and flattened at a separate facility within the factory premises. Once all the input materials are ready, skilled workers handcraft some of the finest heating elements on offer at the heating element assembly line.

Ruby Mica has been a long-term heating-elements manufacturer and supplier to some of the most prestigious European catering equipment manufacturers. These heating elements have stood the test of time with their superior quality and high-performance parameters intact.

Ruby Mica's commitment is simple; "if you can design it, we can manufacture it." See your heating-element blueprints come to life at our comprehensive manufacturing facility in the able hands of field experts who best understand electrical heating and resistance wires.

