Product DATA SHEET

MICA(0700) MICA AND BONDED MICA PRODUCTS

Mica is a naturally occurring mineral, which is present in most granite rock formations. It occurs as a geological fault between two layers of hard rock. In brief, Mica is a generic term applied to a group of complex alumino-silicate materials, having a plate like structure, with different chemical compositions and physical properties. Unfortunately, most of the world's mica is commercially of little value and is only suitable for grinding into mica powder. Deposits of mica suitable for use in electrical applications are found in India, Madagascar and to a lesser extent in Canada, where the mineral is mined and processed (cut and split).

TYPES OF MICA

Muscovite mica is the most commonly used mica in electrical insulation. Muscovite mica is by far the best electrical properties of all the micas and is commonly available in two colour groups:

- Ruby (varies in colour from clear through pink to red / brown)
- Green (varies in colour from pale green through olive to a dark green)

The crystal structure of the two types is very similar though the most commonly used of the two is ruby mica. Ruby mica is harder than green mica and can be split into very thin films.

Phlogopite mica is commonly called amber mica and varies in colour from light silver to dark brown. Phlogopite is softer than muscovite micas and has poorer electrical properties and chemical resistance. The material can however withstand considerably higher temperatures without dehydration and has good abrasion characteristics. It is commonly used in the manufacture of heating elements and as the base material for the manufacture of commutator micanite.

Biotite and lepidolite (magnesium iron and lithium micas) are two grades of mica that are of little or no commercial use in the electrical industry as they exhibit poor electrical properties and are difficult to split into even films.

GRADING

Mica is mined in irregular shaped blocks from which splittings are produced. The splittings are graded by size. The grading is based upon the maximum usable rectangle that can be cut from the splitting. Briefly, sizes vary from 1's (155 to 226cm²) to 7's (4.8 to 6.4cm²). The most commonly used grades for the production of micanite tapes and sheets are 5's and 5.5's (19 to 39cm² and 14.5 to 19cm²).

Large splittings are rare and consequently very expensive. The largest size grading is OOEE special with an area of 645cm² or greater and with a minimum dimension of one side of usable rectangle of 10.2cm. Splittings are also visually graded according to appearance and can range from clear ruby (V-1) to green brown stained (V-16).

TYPICAL PROPERTIES OF PURE MICA

The following properties are typical for muscovite and phlogopite micas. It should be remembered that as mica is a naturally occurring mineral, properties might vary slightly.

Properties	Units	Muscovite	Phlogopite
Colour	-	Ruby/ green / white	Amber / yellow
Density	gm/cm³	2.6 - 3.2	2.6 - 3.2
Specific heat	-	0.21	0.2
Hardness	Mho scale	2.8 - 3.2	2.5 - 3.0
Optic axial angle	degrees	55 - 75	5 - 25

Tensile strength (approx)	MN/m²	175	1000
Shear strength	MN/m²	220-270	1000-1300
Compressive strength	MN/m²	190-285	-
Coefficient of expansion / ºC perpendicular to plane of cleavage	$x10^{-6}$	9 – 36	30 – 60
Calcining temp	ºC	700 – 800	900 – 1000
Max. operating temp	ºC	500 – 600	800 – 900
Thermal conductivity perpendicular to cleavage plane	cal/sec/cm²/ºC /cm (approx)	0.0013	0.001
Thermal conductivity parallel to cleavage plane	cal/sec/cm²/ºC /cm (approx)	-	0.012
Water of constitution	%	4.5	3.0
Apparent electric strength 0.025mm - 0.075mm	kV/mm	120 – 200	-
Apparent electric strength RMS @ 15ºC	kV/mm	40 – 80	-
Permittivity	-	6 – 7	5 – 6
Loss tangent	$x10^{-4}$	1 – 4	10 – 50
Vol. resistivity	$x10^{13}$ ohm/cm	4-20000	0.1 – 10

Notes
Acid reaction: Affected by hydrofluoric and sulphuric acids.
Above values are typical and are given for guidance only.

MICANITE

Micanite is the name given to materials built up from mica splittings or mica paper incorporating a resinous binder. Various types of binder are commonly used and each imparts characteristic properties to the micanite.

In addition to mica paper, three qualities of mica splittings are commonly used, i.e. clear, stained and slightly spotted. The thickness of the splittings is normally in the range 0.025mm to 0.075mm and they are built up in such a way as to give an overlap of each splitting. The overall thickness of each built up layer is 0.05mm - 0.075mm.

MICA FOLIUM

Mica folium is built from regular sized splittings bonded to a Kraft paper or tissue backing using natural shellac as a binder. Mica folium is commonly used for bus bar insulation. It is applied by warm wrapping the conductor until the required insulation thickness is built up and then baked at elevated temperature to give a hard insulating cover with very high dielectric strength. Mica folium is also used as a starting material in the manufacture of micanite tubes.

FLEXIBLE MICANITE

This is the name given to a wide range of insulating materials built from mica, which are used for cold wrapping of insulators. Flexible micanite is available with glass cloth backing on one or both sides in a wide range of thickness, with either shellac or silicone bond.

MOULDING MICANITE

A more rigid insulating material incorporating built mica splittings with a high level of shellac binder (approximately 20%). Moulding micanite may be formed or wrapped warm and will harden on cooling.

HEAT RESISTING MICANITE

Manufactured from specially selected splittings, incorporating a low level (approx 5 - 6%) shellac binder. This gives a rigid material, which can be punched or cut to shape. Heat resisting micanite is often used as an insulator in applications where the binder is decomposed at the operating temperature, which leaves only the mica insulation in place. Under such circumstances the mica must be firmly supported by sheathing or cladding. Heat resisting micanite can be supplied cut into rings for electromagnet insulation up to 60"

in diameter.

ATTAMICA H

Manufactured from integrated mica paper bonded with a high temperature silicone resin. This product has very good heat resistant properties and is used in many applications as a replacement for asbestos products in addition to exhibiting extremely good electrical properties.

MICANITE TUBES

Micanite tubes can be supplied wound to customer requirements. Two basic types are available.

Tubes produced from mica splittings
These are wound from mica folium produced with a shellac binder and baked at elevated temperature to give a rigid tube with very high dielectric strength.

Tubes produced from integrated mica paper
These are normally produced using a silicone resin binder and can be produced to a closer dimensional tolerance than tubes from mica splittings.

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