



Indian Minerals Yearbook 2019

(Part- III : Mineral Reviews)

58th Edition

MINOR MINERALS

30.16 MICA

(FINAL RELEASE)

**GOVERNMENT OF INDIA
MINISTRY OF MINES
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August, 2021

30-16 Mica

Mica is widely distributed and occurs in igneous, metamorphic and sedimentary regimes. Mica group represents 34 phyllosilicate minerals that exhibits a layered or platy structure. Commercially important mica minerals are muscovite (potash or white mica) and phlogopite (magnesium or amber mica). Granitic pegmatites are the source of muscovite sheet, while phlogopite is found in areas of metamorphosed sedimentary rocks into which pegmatite-rich-granite rocks have been intruded. It possesses highly perfect basal cleavage due to which it can easily and accurately split into very thin sheets or films of any specified thickness. It has a unique combination of elasticity, toughness, flexibility and transparency. It possesses resistance to heat and sudden change in temperature and high dielectric strength. It is chemically inert, stable and does not absorb water.

For over hundred years, India has enjoyed the monopoly in the production and export of sheet mica in the world. Of late, there has been a steady downfall in the production of mica. This declining trend could be attributed to fall in the demand of natural mica in the world market due to technological improvements that facilitate use of reconstituted mica and emergence of mica substitutes. However, there are sufficient resources in the country to meet the domestic requirement and export demand.

RESERVES/RESOURCES

Most important mica-bearing pegmatites occur in Andhra Pradesh, Bihar, Jharkhand, Maharashtra, Odisha, Rajasthan and Telangana. Occurrences of mica pegmatites are also reported from Gujarat, Haryana, Karnataka, Kerala, Tamil Nadu and West Bengal.

As per NMI database based on UNFC system, the total reserves/resources of mica in the country as on 1.4.2015 has been estimated at 6,35,302 tonnes out of which 1,14,433 tonnes are placed under Reserves category and 5,20,869 tonnes under Remaining Resources category. Andhra Pradesh leads with 41% share in country's total resources followed by Rajasthan (28%), Odisha (17%),

Maharashtra (13%), Bihar (2%) and a small quantity of resources is found in Jharkhand and Telangana (Table- 1).

PRODUCTION

As per Govt of India Notification S.O. 423(E), dated 10th February 2015, 'mica' has been declared as 'Minor Mineral', hence the producers report the production data directly to the respective States and not to IBM. However, efforts were made to collect this information through correspondence with the State Directorates of Mining and Geology of individual States or visiting their websites. But data of only a few States could be collected. All possible information/data that could be gathered has been presented in this Review.

Statewise production of mica is furnished in Table-2.

Table-2: Statewise Production of Mica

(In tonnes)

State	Year		
	2016-17	2017-18	2018-19
Andhra Pradesh	53630	15217	-
Rajasthan	3124	6459	-

Source: As received from State DGMs and their websites.

USES & SPECIFICATIONS

Natural sheet mica is used in Electrical and Electronic Industries in the form of blocks, splittings and films or built-up mica called "micanite". Sheet mica is used in manufacturing fabricated and micanite products, such as, capacitors and commutator segments. Micanite or built-up mica is partly overlapped, irregular-shaped and arranged as splittings cemented together with either an organic or inorganic binder. Other uses of sheet mica include gauge glasses of high pressure steam boilers, diaphragms of oxygen-breathing equipment, marker dials of navigation compasses, quarterwave plates for optical instruments, window covers for radiation pyrometers & thermal regulators, stove window, chimneys for gas & petromax lamps, diaphragms in

**Table – 1 : Reserves/Resources of Mica as on 1.4.2015
(By Grade/States)**

Grade/State	Reserves			Remaining Resources					Total Resources (A+B)	
	Proved STD111	Probable STD121 STD122	Total (A)	Feasibility STD211	Pre-feasibility STD221 STD222	Measured STD331	Indicated STD332	Inferred STD333		Reconnaissance STD334
All India : Total	82187635	20035595 12209547 114432777	38252500 10605400 124089303 143353477 56528016 144446953 3593715 520869364 635302141							
By Grade										
Unclassified	82187635	20035595 12209547 114432777	38252500 10605400 124089303	143353477	56528016	144446953	3593715	520869364	635302141	
By States										
Andhra Pradesh	61942537	18293548	- 80236085 18960000	-	93830994	12894000 51668132	-	177353126	257589211	
Bihar	-	-	-	-	-	13066667	7700	13074367	13074367	
Jharkhand	-	-	-	-	-	1494430	170700	1665130	1665130	
Maharashtra	-	-	-	65916000	-	15120000	-	81036000	81036000	
Odisha	-	-	-	51856000	-	26712000	-	105280000	105280000	
Rajasthan	20245098	1742047 12209547 34196692	19292500 10605400 5732418 49522483 16922016 36385724 3415315 141875856 176072548							
Telangana	-	-	-	584885	-	-	-	584885	584885	

Figures rounded off

microwave transmitters and insulation wrappers for high tension radar coils. Besides, high quality natural mica sheets are used in helium-neon lasers where mica sheet works as retardation plate. Of late, mica washers are extensively used in Computer Industry.

Mica paper or reconstituted mica is a paper-like material made by depositing fine flakes of scrap mica as a continuous mat which is then dried. Mica paper is usually impregnated with organic binder. Primary end-uses of mica paper are the same as for micanite or built-up mica.

Micanite is used in electrical insulation mainly because natural mica sheet of sufficient thickness is not always available. This is used in copper commutator segments of DC universal motors and generators, moulding plates from which V-rings are cut and stripped for use in commutators. These moulding plates also find use in the form of tubes and rings as an insulator in transformers, armatures and motor starters. As flexible plates, micanite is also used in electric motors and generator-armatures, field coil insulators & magnet and commutator core insulation. Similarly, as heater plates, micanite is used where high insulation strength at high temperature is required.

In the Construction Sector, mica scrap/ground mica is used in jointing cement for gypsum boards, asphaltic roofings & damp-proof seal, and insulation boards. Ground mica acts as reinforcing filler in plaster for textured coatings. Mica is used in insulation bricks, slabs and tiles because of its excellent thermal and insulating properties. Dry-ground 50 mesh mica is used in the flux coating for arc welding electrodes, with flux containing 3 to 5% mica powder. In paints, mica in the form of powder is used as filler and as an extender because it provides a smoother consistency, improved workability and imparts increased resistance to water penetration and weathering. It also facilitates suspension due to its relatively low specific gravity and platy morphology. Mica is used mainly in four types of paints, such as, bituminous emulsions, exterior paints, fire-retardant paints and pearlescent pigments. Mica is added to drilling fluids to get off the lost circulation zones. The platy structure of mica facilitates the overlapping of particles to form a tight layer or wall, thereby preventing further fluid loss.

Ground mica is used in the Rubber Industry as a dusting agent and as an inert filler in the production of rubber. Mica fillers increase the hardness, tensile strength and tear resistance of

rubber articles. In Plastic Industry, mica is used as a filler and reinforcer in thermoplastics to improve the electrical properties, flexural strength & modulus, stiffness, heat deflection temperatures and resistance. Dry-ground mica powder is used in small quantities in cosmetic applications. The property of high resistance of mica to the effect of the sun rays, moisture, gases, water and other chemicals, enables the use of dry-ground mica powder in small quantity to improve the decorative coating and lustre of wallpaper, printing and ceiling papers, etc. Wet-ground mica powder is used in paints, cosmetics, rubber, etc. as a filler. Small quantities of scrap mica/ground mica are also used in industries like foundries as coating to foundry cores and moulds, as a dry lubricant to prevent hot bearings from seizing up.

SPECIFICATIONS

The Bureau of Indian Standards (BIS) has prepared standards for (a) processed mica, (b) fabricated mica and (c) mica-based products. BIS has brought out the following specifications for mica for various purposes:

IS:1175 – 1981 (First Revision, Reaffirmed 2011):

Deals with methods of grading and classification of muscovite mica blocks, thins and films according to visual size, visual qualities and presence of structural imperfections.

IS:1885 (Part-53)-1980 (Reaffirmed 2007): Deals with electrotechnical vocabulary, Part-53, Mica.

IS:2001-1968: Deals with specifications of fixed silvered mica capacitors.

IS:2464-1963 (Reaffirmed 2008): Deals with specifications of built-up mica for electrical purposes.

IS:9043-1979 (Reaffirmed 2011): Deals with grading (by size) of phlogopite mica blocks, thins, films and splittings.

IS:9044-1979 (Reaffirmed 2011): Deals with methods of measuring thickness of mica blocks, thins, films and splittings.

IS:9045-1979 (Reaffirmed 2011): Deals with thermal classification of phlogopite mica splittings.

IS:9299 (Part 3/Sec.1)- 1979 (Reaffirmed 2003): Deals with rigid mica material for commutator separators.

IS:9299 (Part3/Sec.2)-1982 (Reaffirmed 2003): Deals with moulding mica materials for electrical purposes.

IS:9299 (Part 3/Sec. 3)-1982 (Reaffirmed 2008): Deals with flexible mica flake tape for insulation of electrical machines.

IS:9299 (Part 3/Sec. 4) (Reaffirmed 2008): Deals with rigid mica materials for heating equipment.

IS:13357: Methods of grading and visual classification of muscovite mica splittings.

SUBSTITUTES

Mica and its products can be substituted to some extent by using alumina, ceramics, bentonite, glass, mylar polystyrene, fused quartz, silicon, talc, bakelite, teflon, nylon synthetic mica, acrylate polymers, cellulose acetate, fibre glass, etc.

Some lightweight aggregates, such as, diatomite, vermiculite and perlite may be substituted for ground mica when used as filler. Ground synthetic fluorophlogopite, fluorine-rich mica, may replace natural ground mica for uses that require thermal and electrical properties of mica.

Sheet mica is used in electrical components, electronics and atomic force microscopy. Many products can be substituted for mica in electrical

and electronic uses. Substitutes include Acrylic, Benelex, Cellulose acetate, Delrin, Duranel N, Fibreglass, Fishpaper, Kel F, Kydex, Kapton Lexan, Lucite, Mylar, Nylon, Nylatron, Nomex, Noryl, Phenolics, Plexiglass, Polycarbonate, Polyester, Styrene, Teflon, Vinyl-PVC and Vulcanised Fibre.

TRADE POLICY

As per the Foreign Trade Policy, 2015-20 and the effective Export-Import Policy, exports and imports of varieties of mica blocks, splittings, powder, waste and scrap under heading 2525 are allowed without restrictions.

WORLD SCENARIO

Resources of scrap and flake mica are available in clay deposits, granite, pegmetite and schist and are considered more than adequate to meet anticipated world demand in the foreseeable future. World resources of sheet mica have not been formally evaluated because of the sporadic occurrences of this material. Large deposits of mica-bearing rock are known to exist in countries, such as, Brazil, India and Madagascar. Limited resources of sheet mica are available in the United States.