

PYROPHYLLITE



Indian Minerals Yearbook 2017

(Part- III : Mineral Reviews)

56th Edition

MINOR MINERALS 30.19 PYROPHYLLITE

(FINAL RELEASE)

**GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES**

Indira Bhavan, Civil Lines,
NAGPUR – 440 001

PHONE/FAX NO. (0712) 2565471
PBX : (0712) 2562649, 2560544, 2560648
E-MAIL : cme@ibm.gov.in
Website: www.ibm.gov.in

March, 2018

30-19 Pyrophyllite

Prophyllite ($\text{Al}_2\text{O}_3 \cdot 4\text{SiO}_2 \cdot \text{H}_2\text{O}$) is a hydrous silicate of aluminium. It resembles closely to talc in many physical and optical properties but differs in chemical composition. Pyrophyllite finds application in high-grade ceramics & refractories and also as a filler in pesticide industry. Production of pyrophyllite is mainly reported from Chhatarpur, Tikamgarh and Shivpuri districts of Madhya Pradesh; Mahoba, Hamirpur, Jhansi and Lalitpur districts of Uttar Pradesh; Bhandara district of Maharashtra; Bhilwara and Udaipur districts of Rajasthan; Anantapur and Kadapa districts of Andhra Pradesh; and Kendujhar district of Odisha.

RESERVES/RESOURCES

The total reserves/resources of pyrophyllite in India as per NMI data, based on UNFC system as on 1.4.2015 have been placed at 59.61 million tonnes of which about 42%; i.e., 24.93 million tonnes are in Reserves category. Among the states, Madhya Pradesh accounted for 48% resources, followed by Odisha (23%) and Uttar Pradesh (13%). The remaining (16%) resources are in Andhra Pradesh, Maharashtra, Jharkhand and Rajasthan. Gradewise, Refractory grade accounts for 24%, followed by Insecticide grade 22%, Ceramic grade 18% and Insecticide & Ceramic mixed grade 14%. The remaining 18% belongs to Others, Unclassified and Not-known grades (Table-1).

EXPLORATION & DEVELOPMENT

The exploration & development details, if any, are given in the review on Evarying "Exploration & Development" in "General Reviews".

PRODUCTION & STOCKS

As per the Govt. of India Notification S.O.423(E), dated 10th February 2015, 'pyrophyllite' has been declared a 'Minor Mineral'. Hence, the production data is not available with IBM.

MINING, MARKETING AND TRANSPORT

Most of the pyrophyllite mines in the country are operated manually with exception of a few semi-mechanised opencast mines in Madhya Pradesh which deploy excavators and payloaders. In some mines, benches of height varying from 1.5 to 3.5 m and width varying from 4 to 10 m have been developed in overburden. Pyrophyllite is sorted out by experienced workers on visual assessment and then transported to grinding units. The ore as mined is crushed with suitable jaw crusher down to 20 mm size and then is ground to 250 mesh size using ceramic balls as grinding media or the requirement as specified by the consumers. For ensuring qualitative improvement in the mine environment and ecology, some mine owners have planted trees like Acacia, Shisham, Eucalyptus, Jamun and Mango.

USES AND SPECIFICATIONS

Pyrophyllite is harder than talc. Unlike talc, pyrophyllite does not flux when subjected to fire and maintains its strength after heating. It is, therefore, used in high-grade ceramic products, electric insulators and refractories. Pyrophyllite imparts thermal shock resistance to ceramic bodies. It is also used as filler and dusting powder in various industries. In Glass Industry, pyrophyllite is used

PYROPHYLLITE

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

Grade/State	Reserves				Remaining Resources				Total Resources (A+B)				
	Proved STD111	Probable		Total (A)	Feasibility STD211	Pre-feasibility		Inferred STD333		Reconnaissance STD334	Total (B)		
		STD121	STD122			STD221	STD222						
All India	16575493	4322386	4035079	24932958	9539407	8301411	4240016	1118943	3589624	7533340	360006	34682745	59615703
By Grades													
Refractory	5839430	1835057	746404	8420890	1915721	5030576	204467	247568	49730	1084237	17161	8549460	16970350
Ceramic	2323554	1128868	1040329	4492951	2047247	819750	1286251	553850	48114	1803804	43200	6604215	11097166
Insecticide	2495205	644502	415394	3555101	249016	1865059	1990109	176400	3198926	1956786	51240	9487536	13042636
Insecticide & Ceramic Mixed	4960978	492259	1446327	6899564	52665	231942	260177	37563	77451	934862	0	1594660	8494224
Others	342379	221700	110850	674929	5022557	41841	0	0	60570	60585	0	5185553	5860482
Unclassified	435404	0	129956	565360	210351	309093	427599	94450	134360	1456906	248405	2881163	3446523
Not-Known	178544	0	145619	324163	41850	3150	71413	7112	20473	236160	0	380158	704321
By States													
Andhra Pradesh	39376	0	9441	48817	366494	75201	311209	0	108831	737855	0	1599590	1648407
Jharkhand	858	0	328	1185	0	0	0	0	0	0	0	0	1185
Madhya Pradesh	9786485	2242501	1907116	13936102	1860354	2976581	2738198	520801	3294772	2984100	248405	14623211	28559313
Maharashtra	0	0	705169	705169	45332	4780000	0	0	0	407160	0	5232692	5937861
Odisha	2781889	1094902	0	3876791	6978702	216661	766105	80	40	1782070	68401	9812058	13688848
Rajasthan	368774	214870	179514	763158	156136	38989	210982	219612	119469	551225	0	1296413	2059571
Uttar Pradesh	3598112	770113	1233511	5601736	132189	213979	213522	378450	66512	1070930	43200	2118782	7720518

Figures rounded off

PYROPHYLLITE

as a source of aluminium instead of felspar. Owing to its softness and mode of occurrence in lumps, it is used extensively in handicraft industries for making various articles.

Low thermal expansion and shrinkage characteristics of pyrophyllite makes it a useful ingredient in ceramic blends and may substitute either pitcher (grog) or silica. Pyrophyllite allows faster firing cycles in the manufacture of whiteware.

In production of stoneware and chinaware, more mechanical strength as well as improved whiteness can be achieved at lower firing temperature. Pyrophyllite is quite stable up to 800 °C and hence, it is consumed in refractory as well as in wall tiles, sanitaryware, electrical porcelain and other ceramic and vitreous china products. Pyrophyllite is non-abrasive, inert with a neutral pH, as well as absorbant providing good flowability which allows it to be used as a diluent, extender, vehicle and carrier for liquids such as fungicide, insecticide, herbicide and fertilizer.

The BIS has prescribed the specifications for pyrophyllite for Ceramic Industry (IS:11477-2011 first revision) reaffirmed on March 2012.

The consumers in Refractory Industry generally prefer pyrophyllite containing 26 to 28% Al_2O_3 , 3 to 4% alkali and having 23 to 25 Pyrometric Cone Equivalent (PCE). For Insecticide Industry, the

specifications of talc/steatite can also be applicable to pyrophyllite as given below:

Loss on Ignition	: 7% max.
Matter soluble in HCl	: 3% max.
Fe_2O_3	: 1.5% max.

WORLD SCENARIO

The world reserves of pyrophyllite are quite large. Republic of Korea accounts for large part of the production followed by Japan, India and Turkey.

The prices of pyrophyllite are normally influenced by aluminium content, levels of iron & other impurities, colour, abrasiveness and adsorbency etc.

FUTURE OUTLOOK

Globally, market demand for pyrophyllite is expected to increase on account of growing ceramic industry and other refractory applications over the next few years. Increasing number of applications of pyrophyllite in various end-use industries including paints, electrical, porcelain, insecticides, machinery, rubbers and plastics are likely to aid market growth over the next few years. Pyrophyllite will continue to face competition from bentonite and attapulgit in carrier applications. However, use in filler applications appears to be stable.