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MINOR MINERALS

30.19 PYROPHYLLITE

(ADVANCE RELEASE)

GOVERNMENT OF INDIA
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30-19 Pyrophyllite

Pyrophyllite ($Al_2O_3.4SiO_2.H_2O$) 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 & Shivpuri districts of Madhya Pradesh; Mahoba, Hamirpur, Jhansi & Lalitpur districts of Uttar Pradesh; Bhandara district of Maharashtra; Bhilwara & Udaipur districts of Rajasthan; Anantapur & 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 has 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 28%, followed by Insecticide grade (22%), Ceramic grade (19%) and Insecticide & Ceramic mixed grade (14%). The remaining 17% belongs to Others, Unclassified and Not-known grades (Table-1).

EXPLORATION & DEVELOPMENT

The exploration & development details, if any, are covered in the Review on "Exploration & Development" under "General Reviews".

PRODUCTION

As per Govt of India Notification S.O. 423(E), dated 10th February 2015, 'pyrophyllite' 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 pyrophyllite during 2019-20 to 2021-22 is furnished in Table-2.

Table-2: Statewise Production of Pyrophyllite

(In tonnes)

State	Year		
	2019-20	2020-21	2021-22
Andhra Pradesh	10610	14762	-
Rajasthan	14300	19050	113546
Odisha	5199	2987	5539

Source: *As received from State DGMs and their websites.*
Note *: " - " NA.*

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 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 a good absorbent 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.

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

(In tonnes)

Grade/State	Reserves					Remaining Resources							Total Resources (A+B)
	Proved	Probable		Total (A)	Feasibility STD211	Pre-feasibility		Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334	Total (B)	
	STD111	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	1040529	4492951	2047247	819750	1286251	555850	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	-	1594660	8494224
Others	342379	221700	110850	674929	5022557	41841	-	-	60570	60585	-	5185553	5860482
Unclassified	435404	-	129956	565360	210351	309093	427599	94450	134360	1456906	248405	2881163	3446523
Not-Known	178544	-	145619	324163	41850	3150	71413	7112	20473	236160	-	380158	704321
By States													
Andhra Pradesh	39376	-	9441	48817	366494	75201	311209	-	108831	737855	-	1599590	1648407
Jharkhand	858	-	328	1185	-	-	-	-	-	-	-	-	1185
Madhya Pradesh	9786485	2242501	1907116	13936102	1860354	2976581	2738198	520801	3294772	2984100	248405	14623211	28559313
Maharashtra	-	-	705169	705169	45532	4780000	-	-	-	407160	-	5232692	5937861
Odisha	2781889	1094902	-	3876791	6978702	216661	766105	80	40	1782070	68401	9812058	13688848
Rajasthan	368774	214870	179514	763158	156136	38989	210982	219612	119469	551225	-	1296413	2059571
Uttar Pradesh	3598112	770113	1233511	5601736	132189	213979	213522	378450	66512	1070930	43200	2118782	7720518

Figures rounded off.

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.

FUTURE OUTLOOK

Globally, market demand for pyrophyllite is expected to increase over the next few years on account of steady growth witnessed in the Ceramic Industry and its other refractory applications. 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 attapulgite in carrier applications. However, use in filler applications appears to be stable.