

Indian Minerals Yearbook 2021

(Part-III: Mineral Reviews)

60th Edition

MINOR MINERALS 30.19 PYROPHYLLITE

(ADVANCE RELEASE)

GOVERNMENT OF INDIA MINISTRY OF MINES INDIAN BUREAU OF MINES

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30-19 Pyrophyllite

Pyrophyllite (Al₂O₃.4SiO₂.H₂O) 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 2018-19 to 2020-21 is furnished in Table-2.

Table-2: Statewise Production of Pyrophyllite

(In tonnes)

| State | | Year | |
|----------------|---------|---------|---------|
| | 2018-19 | 2019-20 | 2020-21 |
| Andhra Pradesh | 870 | 10610 | 14762 |
| Rajasthan | 40000 | 14300 | 19050 |

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)

| Provide Prov | 9 | | Re | Reserves | | | | | Remaining Resources | Resources | | | | E |
|--|--------------------------------|----------|---------|----------|-------------|-------------|-----------|---------|---------------------|-----------|----------|-------------|----------|----------------|
| SED-11 STD121 STD122 STD222 STD222 STD222 STD222 STD222 STD223 S | Grade/State | Proved | Prα | bable | Total | Feasibility | Pre-feasi | | [easured | Indicated | Inferred | Reconnaissa | | Resources |
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| csh 9786485 2242501 1907116 13936102 1860354 297681 2738198 520801 3294772 2984100 248405 1462211 2 - | Jharkhand | 828 | ı | 328 | 1185 | 1 | 1 | 1 | 1 | ı | 1 | 1 | 1 | 1185 |
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| 2781889 1094902 - 3876791 6978702 216661 766105 80 40 1782070 68401 9812058 1 368774 214870 179514 763158 156136 38989 219082 219612 119469 551225 - 1296413 3598112 770113 1233511 5601736 132189 213522 378450 66512 1070930 43200 2118782 | Maharashtra | 1 | 1 | 705169 | 705169 | 45532 | 4780000 | 1 | 1 | 1 | 407160 | 1 | 5232692 | 5937861 |
| 368774 214870 179514 763158 156136 38989 210982 219612 119469 551225 - 1296413 3598112 770113 1233511 5601736 132189 213522 378450 66512 1070930 43200 2118782 | Odisha | 2781889 | 1094902 | ı | 3876791 | 6978702 | 216661 | 766105 | 8 | 94 | 1782070 | 68401 | 9812058 | 13688848 |
| 3598112 770113 1233511 5601736 132189 213979 213522 378450 66512 1070930 43200 2118782 | Rajasthan | 368774 | 214870 | 179514 | 763158 | 156136 | 38989 | 210982 | 219612 | 119469 | 551225 | 1 | 1296413 | 2059571 |
| | Uttar Pradesh | 3598112 | 770113 | 1233511 | 5601736 | 132189 | 213979 | 213522 | 378450 | 66512 | 1070930 | 43200 | 2118782 | 7720518 |

Figures rounded off.

PYROPHYLLITE

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% Al₂O₃, 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. Fe₂O₃ : 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.