

## Morpho-chemistry of Pyrophyllite in the Schistose Rock in a part of the Singhbhum Craton, Odisha, India

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**Abstract:** This paper discusses the morphological vs compositional variation of pyrophyllite from the schistose rocks exposed near Keonjhar. Morphologically, pyrophyllite in the study area can be grouped into six categories such as: Flaky, Laminated, Bladed, Fibrous, Platy and Granular. The first three types are enriched in alumina ( $Al_2O_3$ -31 to 33%) and poor in silica ( $SiO_2$ -49 to 56%) content while the other three varieties are poor in alumina ( $Al_2O_3$ -20 to 27%) but contain higher amount of silica ( $SiO_2$ -58 to 73%). Pyrophyllite shows different habits under scanning electron microscope. Compositional difference between these micro-morpho types are established through in-situ analysis by the SEM-EDAX system. A pristine pyrophyllite exhibits acicular radiating, anhedral crystalline, globular, massive, monoclinic crystalline and banded forms. Pyrophyllite containing Fe-impurities (6.9 to 18% Fe) appear in needle, rod and prismatic form. Similarly, pyrophyllite having Mg-impurities (platy & flaky) and Mg+Fe impurities (sub-hedral crystalline) show different habits. The K-containing pyrophyllite ( $K_2O$ : 4.6 to 8%) reveals different forms like: inter-grown, porous, spotted, bedded and ooloidal. A spongy / mesh structure is shown by pyrophyllite having ~ 11% Na as contaminant.

The study demonstrates the inter-dependance nature between different habits and composition of pyrophyllite mineral in the schistose rock. Growth of pristine type or the one having impurities like Fe, Mg, K or Na depends upon their protolithic composition. The clean variety is most likely formed through solution and precipitation without any contamination. The Fe-containing pyrophyllite appears to have iron minerals in their inter-granular space, which might have been derived from the breaking down of biotite. Similarly, both Mg and Fe + Mg-containing pyrophyllite are derived from phlogopite or biotite. Both K and Na-containing pyrophyllite have probably formed at the expense of orthoclase / mica and plagioclase respectively.

**Keywords:** Pyrophyllite; Singhbhum craton; Micro-morphological analysis; SEM