

Petrology and Geochemistry of Magmatogenic Phosphate Ore Deposits in Proterozoic Singhbhum Group of Rocks along Tamar-Porapahar Rift Zone, Eastern India,

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A series of Magmatogenic phosphate ore deposits have been studied within the Proterozoic Singhbhum Group of rocks along a WNW-ESE trending lineament which has been established as Tamar-Porapahar rift zone in parts of West Bengal and Bihar, Eastern India. The rifting has been opined as intraplate and non-orogenic. The deposits compare favourably with the alkaline-carbonatite rocks associated mineralisation of Brazil and South Africa.

The comprising rock types as identified by petrological and petrochemical characters include phosphate ore or phoscorite, carbonatite, alkali syenite, phlogopite-amphibolite or glimmerite and alkaline ultramafite. Phosphate ore contains hypautomorphic to automorphic grains of fluor-apatite within a matrix of granular apatite, calcite, magnetite, biotite, relict olivine, sphene and pure pyrochlore ($<0.05\%$ Ta.)

The phosphate ores are characterised by high CaO , P_2O_5 , TiO_2 and $\text{FeO} + \text{Fe}_2\text{O}_3$ with $\text{Fe}_2\text{O}_3 > \text{FeO}$ which is indicative of oxidising environment of crystallisation. Singnificant enrichment (>1000 ppm) in Nb, Zr, Sr, Ba, La & Ce are recorded in phosphatic rocks. Aside from extremely high CaO and low SiO_2 , the carbonatites are enriched in TiO_2 , P_2O_5 and $\text{FeO} + \text{Fe}_2\text{O}_3$.

Phosphate ores appear to have been derived from a primordial alkaline melt either as an immiscible phosphate-silicate liquid or as seggregation product of apatite-magnetite-olivine from the carbonatitic melt.