

Origin and Significance of Paleoproterozoic Jhamarkotra Phosphorite using Geochemical and Isotopic studies, Aravalli Supergroup, Rajasthan, NW India

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Jhamarkotra phosphorite deposits are among the oldest stromatolitic phosphorite deposits belonging to the Paleoproterozoic Aravalli Supergroup, NW India. The detrital zircons from the Jhamarkotra Formation indicate the presence of large populations of 1.9 and 1.7 Ga, indicating that the phosphorites might have been deposited during the Late Paleoproterozoic (McKenzie et al., 2013). The $\delta^{13}\text{C}$ values of carbonates from the Ghasiar (northern part of the Paleoproterozoic Aravalli belt) show positive excursion ($\delta^{13}\text{C}_{\text{carb}}$ ranges from 5.4 to 11.1 ‰ V-PDB). The dolomites from the Jhamarkotra region hosting the stromatolitic phosphorites show positive excursion in organic carbon ($\delta^{13}\text{C}_{\text{org}}$ ranges from -23.30 to -11.10 ‰ V-PDB; Sreenivas et al., 2001). This work reports carbon and oxygen isotope compositions and geochemical data of phosphorite-bearing sediment cores from the Jhamarkotra mine area. The geochemical studies indicate that the unaltered phosphatic stromatolitic section has a P_2O_5 range of 10 to 20 %. However, the mineralized portion resulting in P_2O_5 enrichment due to hydrothermal alteration ranges between 26 and 36 %. The average $\delta^{13}\text{C}_{\text{carb}}$ of carbonate samples from the drill cores is -0.48 ± 1.95 ‰, and average $\delta^{18}\text{O}_{\text{carb}}$ is -11.44 ± 1.46 ‰. Significant differences in terms of the $\delta^{18}\text{O}_{\text{carb}}$ values, Rare Earth Element (REE) patterns, High Field Strength Elements (HFSE) are observed between phosphatic stromatolites and those of non-phosphatic dolomites. The $\delta^{18}\text{O}_{\text{carb}}$ values are about 3 to 4 ‰ lower in the phosphorite-rich zones when compared to the dolomites. Also, the Heavy REEs are enriched in phosphorites with a distinct lowering of HFSE. The uranium concentrations of the phosphorite enriched zone are also higher. The Jhamarkotra phosphorites appear to result from the upwelling of cold deep water into shallow marine environments.

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