Geochemistry of Granitoids and Associated Mafic Enclaves from Archaean Banded Gneissic Complex of Rajasthan: Implications for Crustal Evolution in Northwestern Part of Indian Shield

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Geochemical data comprising major, trace and rare earth elements are presented for Archaean gneisses and associated mafic magmatic enclaves from Banded Gneissic Complex (BGC) of Aravalli craton with the aim to infer their petrogenesis and tectonic settings. The geochemical data -derived interpretations are used to constrain geodynamic settings in which the Archaean crust of northwestern part of Indian shield was generated and evolved.

The gneisses show large variation in concentration of various elements. AFM and Na-Ca-K diagram suggest their calc-alkaline nature. The PM-normalized spidergram show considerable enrichment in LILE and negative anomalies at Nb, Ta, Ti and Y. Examination of geochemical data helps to identify three distinct compositional groups. (1) Type I: LREE enriched with $(La/Yb)_n$ = 5.02-3.79 (avg. 4.42), lower content of total REE (avg. 28 ppm), positive Eu-anomalies and lower concentration of incompatible element contents. (2) Type II: More fractionated REE patterns with $(La/Yb)_n$ = 14.92-7.23 (avg. 9), moderately enriched in total REE (avg.113 ppm) and incompatible elements and also negative Eu-anomalies. (3) Type III: Highly fractionated REE patterns with $(La/Yb)_n$ = 47.29-27.01 (avg. 39), more enriched in total REE (avg. 497 ppm) and incompatible elements, negative Eu-anomalies. The overall synthesis of geochemical data suggests the emplacement of magma in subduction-related tectonic setting. Gradual increase of concentration of incompatible elements from Type I to III gneisses indicates progressive maturity of the subduction environment.

The geochemical characterization of mafic enclaves suggests occurrence of two distinct rock associations. (1). A subduction generated volcanic assemblage and (2) a plume related volcanic assemblage The available data suggest that the Archaean crust in Aravalli craton probably evolved through arc-plume interaction and subsequent amalgamation of magmatic arcs during different stages of its evolution.