Journal of Applied Geochemistry
Vol. 14, No. 4 (2012). pp 414 - 432

GEOCHEMICAL STUDIES OF CLASTIC SEDIMENTS FROM LATE-ARCHAEAN BABABUDAN GROUP, WESTERN DHARWAR CRATON: IMPLICATIONS FOR REDO CONDITIONS, PROVENANCE MODELING AND TECTONIC SETTINGS

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Abstract

The Dharwar Supergroup comprises of the ~2.7 Ga old, lower Bababudan Group and the ~2.6 Ga old upper Chitradurga Group. The Late-Archaean Bababudan Group coarse and fine clastic sediments are investigated in the present work with particular relevance to Precambrian redox conditions, provenance and tectonic setting of their deposition. A quartz pebble conglomerate (QPC) unit overlying the basement gneisses at the base of the Bababudan Group consists detrital uraninite and pyrite indicating reducing conditions during their deposition. The QPC is followed by fluvial quartzites interbedded with metabasaltic lava flows which form the basal unit. These interlayered fluvial quartzites show very low Fe_2O_3/FeO (0.08 to 0.48) indicating low oxygen concentration in the provenance of these sediments. The QPC and quartzites are characterized by strong negative Eu anomalies, high HFSE/HREE. Abundance of Al_2O_3, alkalies, MgO, Cr, Ni, Co, Zr, V, Sc, Rb, Sr, REE and their fractionated REE pattern suggest that restites derived from a dominantly granitic provenance with a minor mafic component and deposited on a stable cratonic platform. The increasing trend of Th/Sc and Zr/Sc ratios in these quatrzites supports continuous igneous differentiation of the source rocks. The overlying sequence of shales/phyllites having higher concentrations of Al_2O_3, $Fe_2O_3^T$, alkalies, Zr, Th, U, V, Cr, La, Ce, Y, in comparison with quartzites and QPC, exhibit fractionated REE patterns similar to AAS, PAAS and UCC reflecting the felsic nature of the source rocks. The Bababudan metapelites of a mafic affinity (chlorite phyllites/ quartzites) occurring in the upper stratigraphic horizon as seen in the Devarahalli-Lingadahalli section, have higher MgO (5.0 to 16.5%), Fe_2O_3 T (9.7 to 18.0%) and Al_2O_3/TiO_2 ratios (13 to 24) when compared to the lower siliciclastic sediments of the Bababudan belt. The major element modelling A-CN-K and A-CNK-FM, trace and REE geochemistry suggest that the precursors of these rocks were probably pelagic clays of high Mg-Al-Fe compositions which were later subjected to greenschist facies metamorphism and metasomatic alteration.

Keywords: Geochemistry, Clastic sediments, Bababudan group, Western Dharwar Craton, Southern India.