Geochemistry of Late Archaean Fine-grained Shales from Dharwar Supergroup in Western Dharwar Craton: Implications on Sedimentary Tectonic Evolution.

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The Dharwar Supergroup consists of 2.7 Ga old lower Bababudan Group and 2.6 Ga old upper Chitradurga Groups. In this study we present geochemical characteristics of the fine-grained shales from older Bababudan and younger Chitradurga Groups with particular relevance to the late-Archaean sedimentation. A quartz pebble conglomerate (QPC) unit overlying the basement gneisses at the base of the Bababudan Group consists detrital pyrite and uraninite grains indicating reducing conditions during their deposition. The QPC is followed by alternating quartzitebasalt lava flow sequence with intermittent chloritic/sericitic schists (metapelites) which are well exposed in NW part of Chitradurga schist belt. These metapelites show high Al_2O_3 (20.56%) and K_2O (4.78%) contents indicating that they may represent basal section of a metasomatized Precambrian paleosol similar to the 2.7 Ga Mt. Roe and Bird paleosol profiles of Australia and South Africa respectively. The Bababudan metapelites of mafic affinity (chlorite phyllites) from Devarahalli-Lingadahalli areas have high MgO (5.0 to 16.5%), Fe₂O₃ T (9.7 to 18.0%) and Al₂O₃/TiO₂ ratios (13 to 24). The major element modelling A-CN-K and A-CNK-FM, trace and REE geochemistry suggests that precursors to these rocks are probably pelagic clays of high Mg-Al-Fe compositions which were later subjected to greenschist facies metamorphism and pre-metasomatic alterations. The younger shales/phyllites of Vanivilas, Ingaldhal and Hiriyur formations of Chitradurga Group in Chitradurga schist belt are characterized by mica-quartz-chlorite+graphite and sulphide mineralogy. They have high CIA and Al2O3/TiO2 ratios, enriched incompatible and HFSE indicate a greater abundance of detrital and residual heavy minerals as well as intense chemical weathering in the source area. Their fractionated REE patterns coupled with La/Th, Th/Sc, Co/Th, Cr and Ni values indicate a mixed mafic-felsic provenance and their deposition in Active Continental Margin (ACM) settings. PGE concentrations of these shales show enrichment of palladium. Overall the Chitradurga Group shales/phyllites are more evolved in nature compared to Bababudan metapelites and show similarities to PAAS and AUC. It is concluded that 2.7-2.6 Ga period in WDC witnessed intense plume activity resulted in highly reducing conditions (2.7 Ga) and a transformation to more oxidizing conditions took place during the deposition of the Chitradurga Group of sediments as indicated by the presence of Stromatolites and Mn formations.

Keywords: Geochemistry, Late-Archaean, Shales, Redox conditions, Dharwar Craton