

GEOCHEMICAL SIGNATURES OF ADONI PORPHYRITIC GRANITOIDS, EASTERN DHARWAR CRATON, INDIA: IMPLICATION FOR PARTIAL MELTING OF LOWER CONTINENTAL CRUST

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Abstract

The porphyritic granitoids of Adoni area, located ~120 km west of Cuddapah basin, are intrusive into the Peninsular Gneissic Complex (PGC) of Dharwar craton. They contain outliers of Gulcheru sediments and are characterized by well-preserved primary igneous foliation. Petrographically, these granitoids are characterized by distinct porphyritic texture marked by the occurrence of prismatic microcline and lath shaped plagioclase phenocrysts within a groundmass of quartz, microcline, plagioclase, amphibole and biotite. Local development of myrmekitic texture is also noticed. The occurrence of perthites in the form of exsolution lamellae of albite within K-feldspar reflect a sub-solvous cooling of the parent magma during crystallization. Geochemical characteristics suggest that the studied granitoids have alkaline to peralkaline composition with prominent A-type signatures that collectively endorse a magmatic origin for their generation. Chondrite-normalized rare earth elements (REE) patterns exhibit enrichment in LREE and prominent negative Eu anomaly ($Eu/Eu^* = 0.13$ to 0.27) indicating significant plagioclase fractionation from the parent magma. Trace and REE compositions combined with primitive mantle normalized trace element abundance marked by positive Rb and negative K, Nb-Ta, Zr-Hf anomalies suggest derivation of these granitoids by low pressure-high temperature partial melting of a tonalitic-granodioritic crust at mid to shallow crustal levels followed by fractional crystallization. The crustal melting has been induced by asthenospheric upwelling and minor basaltic underplating. Higher concentration of U (4-19 ppm) and Th (16-49 ppm) in these granitoids relative to the high field strength elements (HFSE) may reflect U and Th mineralization. Geochemical signatures corroborate a within plate tectonic realm for the origin and emplacement of these granitoids.

Keywords: Eastern Dharwar Craton; Cuddapah Basin; Porphyritic granitoids; Peralkaline; A-type signatures; Within plate.