

Petrogenesis of Archaean grey gneisses from the amphibolite-granulite transition zone of southern Karnataka, India

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In the transition zone of southern Karnataka, the amphibolite-facies grey gneisses occur in spatial association with granulite-facies gneisses. The gneisses with minor, older supracrustal enclaves form the Archaean basement. The gneisses indicate signatures of two major deformational events. The early event (*ca.* 3000 Ma) resulted in the regional fabric development, and the late deformation (*ca.* 2600 Ma) is characterised by narrow, transcurrent shear zones which are occupied by incipient charnockite and granite veins of Closepet type.

Modal composition of the gneisses range from granodiorite to tonalite. The major element variation diagrams indicate magmatic fractionation of limited range. In the AFM diagram the gneisses display calc-alkaline trend; in Qz-Ab-Or and Na-Ca-K plots the gneisses show a trondhjemite to calc-alkaline trend. The trace elements and element ratios indicate that the protoliths of these gneisses were derived from a mantle source. The gneisses display strongly fractionated REE patterns, with concave forms at the HREE end, which are typical features of Archaean TTG.

In order to model, quantitatively, the succession of different mechanisms by which grey gneisses evolved, major elements are used which are tested by REE. The petrogenetic model may be summarized as follows: melting of the upper mantle to form a tholeiitic crust; melting of these tholeiites transformed into garnet-bearing amphibolites to yield parental magma of the grey gneisses. The residue of the melt consisted of hornblende, plagioclase, clinopyroxene and garnet with minor amounts of magnetite and ilmenite. Fractional crystallization of hornblende, plagioclase, and magnetite, with occasional allanite and/or zircon, produced the observed variation.