AOGS 2005

Cardamom Hills charnockite massif, Kerala: New constraints on the origin and evolution.

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Knowledge on the origin of the ancient high-grade terrains is important to understand the formation of earth's crust. An understanding of processes that lead to the evolution of granulites provide vital clues on the formation of the lower crust and thereby the geological activities that shaped the growth of ancient terrains. The South Indian granulite terrain (SGT) is one of the best-exposed granulite terrains to address some fundamental problems concerning the origin and development of granulites. The Cardamom hill massif occupies the largest portion of the SGT and represents a composite mid– to lower crustal domain which played a fundamental role in characterising the Proterozoic geodynamic evolution of the SGT and its position within East Gondwana.

For decades Cardamom massif, located between Palghat-Cauvery and Achenkovil shear zones, remained as one of the least studied sections within the SGT. For want of reliable structural, petrological and geochronological data, diverse opinions have been expressed by previous workers; for eg. Cardamom massif represents an Archaean charnockite province, deeply eroded sections of the oldest crust, igneous (c-type) intrusion providing heat for the metamorphism of the Kerala Khondalite Belt. The present paper summarises new petrological data on the high land massif charnockites of the Cardamom hills and new insights into its evolution.

Field studies in the Cardamom massif have documented a variety of rock types and occurrence of at least two major charnockite types. Most significant observations recorded by the present study are evidence for polydeformation, occurrence of arrested-type charnockites, ultra high temperature pressure conditions of metamorphism (~800°C, 9-12 kbars), magmatic characteristics of charnockites and chemical division of charnockites into two major groups. The non linear variations and segregated grouping in major, minor and trace elements on Harker diagrams support multiple sources. U-Pb zircon and monazite chronology and EPMA dating of monazites document significant age differences in protolith ages of charnockites and a complex pattern of Pan-African and Proterozoic ages. The Southern Granulite Terrain, therefore, may have witnessed polyphase magmatic activities from Late Archean to late Proterozoic. Cardamom massif and the Kerala Khondalite Belt appear to share a common Pan-African tectono-metamorphic evolution.