

Charnockites from the central parts of the Eastern Ghats Belt, India and their implication for East Gondwana reconstruction

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Petrological, geochemical and geochronological characteristics of charnockite in the central parts of Eastern Ghats Belt suggest that the charnockite magmatism was not the manifestation of local tectonic event in the Eastern Ghats but it was related to rather thermal tectonic regime covering large part of the East Gondwana. The 0.6-0.5 Ga event in the EGGB characterized by strong thermal rejuvenations (Takano and Arima, 1999 and Mezger and Cosca, 1999) took an integral part in the major Pan-African tectonothermal event within the East Gondwana. This similarity in ages is strong supports that these areas East Antarctica and EGGB being complementary parts of East Gondwana.

The Proterozoic Eastern Ghats Granulite Belt (EGGB) is made up of high grade metamorphic rocks include charnockites, khondalites, leptynites, basic granulite, migmatite gneiss, anorthosite and alkaline igneous rocks. Charnockites occurs as massive and porphyritic intrusive bodies in the leptynites and khondalites. Petrographic features of the charnockites do not show any significant variation in the mineral parageneses from one location to other. The mineral assemblages can be summarized as orthopyroxene + clinopyroxene + K-feldspar + plagioclase + garnet + biotite + ilmenite + amphibole + spinel, with different modal proportions of phases in different samples.

The charnockites share nearly identical geochemical characteristics even though the samples were collected from widely separated areas in the central part of the EGGB. Geochemical nature of the studied charnockites is fairly comparable to those of Grenvillian charnockites reported from other areas from EGGB and from East Antarctica (Saradhi and Arima, 2000). Three major deformation phases have been reported from many parts of the EGGB (Shaw, 1996 and Tani et al., 1998): D1 deformation is characterized by flattening event, D2 deformation is considered to form the mesoscopic, intrafolial, isoclinal to tight folds with pinch and swell structures and some stretching lineations, and the late stage D3 deformation is marked by macroscopic close fold with overturned axial planes. Both D1 and D2 are parallel and conformable to the NNE-SSW major Eastern Ghats foliation and D3 is almost E-W. Charnockites from the central part of the EGGB exhibits dominant D2 deformational structures (NNE-SSW). Presence of this D2 deformational structures in the massive and porphyritic charnockites indicate that these charnockites might have emplaced prior or during the second deformational event.

Recent geochronological studies from the EGGB suggests that this belt is mostly composed of paleoproterozoic precursors affected by 2.1-1.9 Ga, 1.5-1.4 Ga, 1.1-1.0 Ga and 0.6-0.5 Ga tectonothermal events (Shaw et al., 1997; Sarkar and Paul, 1998 and Takano and Arima, 1999). In the central part of the EGGB, the 2.1-1.9 Ga event reflects intrusion of basic magma in convergent plate boundary environment the 1.5-1.4 Ga event include basic magmatism under an extensional tectonic regime. Peak condition of about 800 to 900 C under 8-9 Kb, preceded by an isothermal decompression are generally recognized in many parts of the EGGB (Dasgupta et al., 1995 Shaw and Arima 1996). Very high pressure conditions over 12 Kb with temperature over 11000 C were identified by Shaw and Arima (1998). Decompression from 12 to 9 Kb under high temperatures 11000- 9500C followed by near isobaric cooling may indicate a possible early continent-continent collision followed by rapid uplift associated with extensional lithosphere collapse (Shaw and Arima, 1998). This ultra-high temperature decompression can be referred as 1.1-1.0 event. The 1.1-1.0 Ga event includes the charnockite magmatism under collision environment (Takano and Arima, 1999). The 1.1-1.0 Ga event has a signature of convergent orogeny associated with charnockite intrusion, is traceable in other parts of the EGGB (Grew and Manton 1986; Aftalion et al., 1998; Shaw et al., 1997 and Takano and Arima, 1999) and from parts of East Antarctica (Young, 1995 and Zhao et al., 1997). This may suggest that charnockite magmatism was not the manifestation of local tectonic event in the Eastern Ghats but it was related to rather thermal tectonic regime covering large part of the East Gondwana. The 0.6-0.5 Ga event in the EGGB characterized by strong thermal rejuvenations (Takano and Arima, 1999 and Mezger and Cosca, 1999) took an integral part in the major Pan-African tectonothermal event within the East Gondwana. This similarity in ages is strong supports that these areas East Antarctica and EGGB being complementary parts of East Gondwana.