Significance of deep-crustal shear zones in the Southern Granulite Terrain, S. India: New Nd model ages of charnockites

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It has been established that the Archean (>2.5 Ga) high-grade crust of the Southern Granulite Terrain (SGT), south India was subject to intense reworking during the Neoproterozoic (0.75 to 0.5 Ga) along a network of crustal-scale ductile shear belts (Bhaskar Rao et al., 1996; Meissner et al., 2002). The shear belts are well developed along an E-W tract of ~ 350 × 70 km described collectively as the Cauvery Shear Zone (CSZ). Owing to the paucity of age data on granulite domains across the shear belts, their tectonic significance either as crustal sutures, terrane boundaries or merely zones of intracrustal dislocation and loci of recurrent deformation remains enigmatic.

A new database of model depleted mantle ages (T_{DM}) for over 80 samples of charnockite gneiss along a N-S corridor encompassing the charnockite highland massifs of Biligiri Rangan (contiguous with the Dharwar Craton), Nilgiri and Kodaikanal, the lowlands of the CSZ and the region east of the Karur-Oddanchatram Shear Zone – KOSZ (Bhaskar Rao et al., 2002) provides a good overview of crust-formation ages in the different domains across the CSZ. Together with multichronometric age data in the literature, the T_{DM} ages suggest that: (1) the Biligiri Rangan massif consists of the oldest rocks in the SGT with protolith ages for charnockite gneiss up to ~ 3.6 Ga and U-Pb zircon age of ~ 3.4 Ga, (2) the Moyar and Bhavani shear zones represent major Paleoproterozoic terrane boundaries (sutures) between the Biligiri Rangan, the Nilgiri and the CSZ blocks, which yield protolith ages of 3.6 – 3.2 Ga, 2.9 – 2.7 Ga and 3.3 Ga – 3.0 Ga, respectively, consistent with the earlier data summarized by Raith et al. (1999) and (3) the KOSZ, rather than the Palghat-Cauvery shear zone, represents the Archean – Neoproterozoic terrane boundary in the SGT.

References

Bhaskar Rao, Y.J., Chetty, T.R.K., Janardhan, A.S. and Gopalan, K., (1996), Contrib. Mineral. Petrol. **125**, 237-250.

Bhaskar Rao, Y.J., Janardhan, A.S., Vijaya Kumar, T., Narayana, B.L., Dayal, A.M., Taylor, P.N. and Chetty, T.R.K., (2002), Mem. Geol. Soc. India (in press).

Meissner, V., Deters, P., Srikantappa, C. and Kohler, H., (1999), Precamb. Res. **114**, 149-175.

Raith, M., Srikantappa, C., Buhl, D., and Kohler, H., (1999), Precamb. Res. **98**, 129-150.

A melt inclusion study of Baffin Bay picrites

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The primitive nature of Baffin Bay picrites is important in understanding their mantle source components. Previous work identified the former existence of MgO-rich liquids (18 wt% MgO) at temperatures >1425°C (Francis, 1985) with depleted N-MORB-like or enriched E-MORB-like trace element abundances (Robillard, *et al.* 1992).

We have examined major and trace element compositions of homogenised melt inclusions (MIs) in olivine phenocrysts from this suite. Primitive olivine phenocrysts (Fo_{85}-Fo_{93}) containing suitable MIs were heated at 1275°C for 6 minutes at fO_2=IW+1 log unit, and then quenched in water. The homogenised MIs were exposed and analysed by EPMA and LA-ICP-MS.

Homogenised MI compositions were corrected for post-entrapment modification (Danyushevsky, *et al.* 2000). The most primitive corrected melt composition contained 21 wt% MgO. Inclusion entrapment temperatures (assuming anhydrous conditions) ranged from 1214 to 1452°C, consistent with Francis (1985). CaO/Al_2O_3 values were mostly 0.80-0.90, although 6 MIs had unusually high values of 0.90-1.1.

For most MIs, Primitive Mantle normalised REE compositions varied from slightly depleted to slightly enriched (La/Yb_n=0.53-1.96) with flattish M-HREE patterns (Eu/Yb_n=0.8-1.7). 4-5% of inclusions exhibited striking enrichments in Nb, Ta, Zr and Hf, with La/Nb and Sm/Zr lower than the remainder of the suite, and very low Rb, Ba, Th, Sr and Pb. One of these had CaO/Al_2O_3=1.1, but trace element data have not yet been obtained from other high Ca/Al MIs.

Projection into Ol-Di-Qz-Jd+CaTs normative space suggests corrected MI compositions could be mixtures of high degree (near cpx-out) partial melts of peridotite generated at P≥1.2GPa and a high Ca/Al (and HFSE/LILE?) component possibly derived from partial melting along an olivine-cpx cotectic.

References

Danyushevsky L., Della-Pasqua, F.N. and Sokolov, S., (2000), *Contrib. Mineral. Petrol.* **138**, 68-83.

Francis D., (1985), *Contrib. Mineral. Petrol.* **89**, 144-154.

Robillard, I., Francis D. and Ludden, J.N., (1992), *Contrib. Mineral. Petrol.* **112**, 230-241.