

Garnet granulites from the Palghat-Cauvery suture zone, southern India: indications of high-temperature Gondwana suture

*Krishnan Sajeew¹

1. Centre for Earth Sciences, Indian Institute of Science

The P - T - t evolution and significance of garnet-bearing granulites from the Palghat-Cauvery Shear Zone is considered as a trace of the Gondwana suture in southern India. The garnet-kyanite rock preserves inclusions of gedrite, spinel and quartz within garnet. Further, the inclusions of sapphirine with spinel in garnet mark the prograde formation of garnet from a low-pressure hydrous condition to higher pressure. The formation of garnet-rim around gedrite, supports the garnet forming reaction after gedrite. The garnet-corundum-staurolite-kyanite assemblage stable at higher pressures probably represents the peak metamorphic stage. Garnet core with inclusions preserves a Fe-rich composition while the rims are Mg-rich and poor in inclusions. The variations in rare earth element chemistry of garnet-core and rim are consistent with the major element variation reaction textures. The rare earth element chemistry of garnet is compared to that in zircons. Most of the staurolite in the studied samples show moderate to high Mg-content. The thermodynamic modeling results assessed the P - T peak of this unusual granulite to be around 14-15 kbar at temperature around 900°C. Textural features, petrogenetic and phase diagram consideration delineate a tight *hairpin*-type anticlockwise P - T path for this granulite. The U-Pb zircon geochronological results correlate the timing of near-peak metamorphism in the Palghat-Cauvery Shear Zone to the Late Neoproterozoic (537 ± 5.1 Ma), probably linked to the East African Orogen and the closure of Mozambique Ocean. This age data are broadly consistent with the zircon SHRIMP ages reported in Collins et al. (2007), as well as the larger database of EPMA ages from monazite and zircons in several ultrahigh-temperature granulite localities in the Madurai Block as well as from the Palghat-Cauvery Shear Zone (Santosh et al., 2006). The extreme crustal metamorphism recorded from the Palghat-Cauvery Shear Zone mark this region as the thermal front between the Proterozoic granulite terranes in the south and the Archean terrane in the north in southern India. The presence of dunite and chromite-bearing lithologies in this belt further confirms the probability of this zone being an oceanic suture. Collins et al. (2007) also considered this zone as a probable trace of the Gondwana suture. The inherited zircon ages recorded in our study indicate that the sediments were derived from an Archean igneous province, similar to the Betsimisaraka suture in eastern Madagascar.

Keywords: Gondwana suture , southern India, UHT metamorphism