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The Namakkal Block of Southern Granulite Terrain is bounded by Salem-Attur Shear Zone to its North and Cauvery Shear Zone to its South. Major litho-units are meta-gabbro, charnockites, granites, hornblende-gneiss, pyroxene granulites, ultramafics and iron formations. Here we describe the high-pressure granulites /retrogressed eclogites (meta-gabbro) from three key localities which are found along the verge of shear zones.

The meta-gabbros exposed in the Devannur-Mahadevi area are located in the southern part of Namakkal Block. They are associated mainly with iron formations, two-pyroxene granulites and websterites. Mg-rich garnet porphyroblasts coexist with the magnesium rich clinopyroxenes porphyroblasts, changing partially to amphiboles and plagioclase along the grain boundaries and fractures. Garnet contains clinopyroxene and quartz inclusions. On the other hand, garnet inclusions in clinopyroxene are not observed. Both garnet and clinopyroxene have exsolution lamellae of rutile or Ilmenite, which formed during retrogression and exhumation. Rutile is also present in the matrix assemblage. It is noted that orthopyroxene is totally absent. The pressure and temperature condition of the peak mineral assemblage (Grt+Cpx+Qtz) are about 21 kbars 900°C, respectively that are determined through isochemical phase diagram.

Retrogressed eclogites/high-pressure granulites are also reported from the Sittampundi area located in the southwest of Namakkal Block, where the opx free meta-gabbroic rocks are associated amphibolites and layered anorthosite. Sajeev et al. (2009) found relict omphacite inclusions in garnet porphyroblasts and described the eclogite facies conditions (about 25 kbar and 1020°C). Amphibole and plagioclase are the retrograde phases in these samples. The U-Pb zircon age from the high-pressure granulites gives 2490 Ma (Sajeev et al., unpublished). The high-pressure granulites are also found in several places towards the North of Namakkal Block. The most notable occurrence is at Kanjamalai near Salem town. The U-Pb zircon ages from the associated rocks also yield 2490 Ma (Anderson et al., 2012, George et al., unpublished). These rocks with geological and textural similarity in the southern localities contain orthopyroxene. Moreover, these samples also have significant variation in the mineral chemistry with high iron content. The pressure and temperature of meta-gabbros are estimated to be about 19 kbar and 800°C, respectively.

Thus, the mineral chemistry and geochronological studies of the high-pressure granulites in a traverse from North to South suggest that the Namakkal block had undergone late Archean metamorphism. Hence, the region possibly represents various levels of a subducted basaltic oceanic crust, with the lower crust to the South and the middle crust to the North. A comprehensive geochemical study, including Rb-Sr and Sm-Nd isotopes as well as zircon SHRIMP age dating are underway, which will be significant in discussing the geotectonic architecture of Namakkal Block of Southern Granulite Terrain in late Archean.

References

Anderson, J.R., Payne, J.L., Kelsey, D.E., Hand, M., Collins, A.S., Santosh, M., 2012. High-pressure granulite at the dawn of the Proterozoic. *Geology* 40, 431-434.

Sajeev, K., Windley, B.F., Connolly, J.A.D., Kon, Y., 2009. Retrogressed eclogite (20 kbar, 1020°C) from the Neoproterozoic Palghat-Cauvery suture zone, southern India. *Precambrian Research* 171, 23-36.

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