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Geochemistry of mafic sanukitoids and Closepet type rocks from Palghat-Cauvery Shear zone: implications on Archaean-Proterozoic crustal evolution in the Southern Granulite Terrain, India.

Soney Kurien, P.[1], Praveen, M.N.[2] and Gupta, G.P[3]

[1]Geological Survey of India, Thiruvananthapuram, sonykurianp@gmail.com
[2]Geological Survey of India, Hyderabad
[3]Geological Survey of India, Kolkata

The Palghat-Cauvery Shear zone (PCSZ) is a major crustal discontinuity of Neoproterozoic age [1] in the Southern Granulite Terrain (SGT) of India. In this work, mafic variety of sanukitoids and Closepet type rocks are being reported from the PCSZ. The sanukitoids are composite magmatic complexes (Late Archean), and the term 'sanukitoid series' has been applied for such rocks with relatively high Mg#, MgO, Sr, Ba, Cr and Ni at any given silica level [2]. The mafic-type sanukitoid occurs as a large body extending for about 25 km with an average width of 2 km near Tenur in the PCSZ. It occurs in close spatial association with TTG gneiss with a sharp contact and parallel to the regional foliation (E-W). It is medium-grained and bears a spotty look due to presence of small clots of hornblende and biotite set in a matrix comprising plagioclase, K-feldspar and quartz. The accessory phases include magnetite, zircon and apatite. This rock exhibits a granoblastic texture. It is weekly foliated indicating its late-kinematic emplacement. Xenoliths of amphibolite and meta-pyroxenite are commonly observed in this sanukitoid. Xenoliths of TTG gneiss are also noted indicating a younger age to sanukitoid compared to the TTG gneiss. Geochemically, this variety of sanukitoid is characterised by 50.95 to 59.50 wt% SiO_2 and the samples fall in the fields of monzodiorite, monzonite and diorite in the TAS diagram. The Mg# varies from 0.51 to 0.58 and the average K_2O and Na_2O are 3.2wt% and 2.6wt% respectively. Cr content varies from 52ppm to 202ppm and Ni content varies from 32ppm to 80ppm. This rock shows high Ba (640 to 1836ppm) and Sr (303 to 734ppm) contents and it has a strongly fractionated REE pattern with LREE enrichment. It is a high-Ti sanukitoid showing K-enrichment in Ca-Na-K diagram. In the K_2O-Na_2O-CaO diagram the samples fall in the Closepet type field.

The Closepet type rock represented by the augen gneiss is mainly seen south of the Bharatapuzha River almost 20 km south of mafic sanukitoid. It is a fine- to medium-grained rock with augens comprising aggregates of minerals like alkali feldspar, plagioclase, quartz and biotite. Biotite and hornblende are the major mafic minerals. This rock occupies a larger area compared to the mafic type sanukitoid and exhibits sheared fabric at many of the locations having sharp/intrusive type contact with the TTGs. SiO_2 content of Closepet type granitoid varies from 57.21 to 62.38 wt% and its Mg# number varies from 41.9 to 53.0. In the TAS diagram, these fall in the fields of monzonite and diorite. It shows high Ba (1332 to 2461 ppm) and Sr (378 to 512 ppm). The Cr (33 to 45 ppm) and Ni (9 to 20 ppm) contents are slightly lesser than those of the mafic sanukitoid. This rock also shows LREE enriched fractionated chondrite normalized REE pattern.

The sanukitoids are very significant in terms of the geodynamic evolution during the late Archaean time. The presence of sanukitoids in the PCSZ, which is regarded as a Cambrian suture zone [3], points to the

subduction zone set-up during the late Archaean and Archaean-Proterozoic transition along PCSZ, where the slab melts must have metasomatised the lithospheric mantle which later, on re-melting, produced the sanukitoids [4] of the PCSZ.

References:

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