DEVELOPMENTS IN GEOSCIENCES IN THE PAST DECADE - EMERGING TRENDS FOR THE FUTURE & IMPACT ON SOCIETY

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Breakneck frictional melt from Gangavalli shear zone, an eastern part of regional Salem-Attur shear zone, Tamil Nadu: an evidence of strike slip brittle deformation

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Intra cratonic deformation in response to compression along the plate margin has been manifested in classical ways in the Southern Granulite Terrane (SGT). The SGT is considered to be the exhumed part of Archean Palaeoproterozoic crust. The terrane consists of high grade metamorphic rock namely TTG, Charnockites, basic granulite, basic-ultrabasic and alkaline intrusive. The Palghat-Cauvery shear zone demarcates its southern margin; the shear zone has been described to be a suture zone between the Archean Palaeoproterozoic southern granulite terrane (SGT) and Southern Madurai-Trivandram Terrane. The pan African subduction has brought suturing of this crustal block. SGT exhibits crustal deformation by way of developing strike slip shear zone in brittle condition. Along the strike slip shear zone cataclasites are produced with crushing of the pre-existing and emplacement of the pseudotachylyte vein. Gangavalli shear zone is one of such major shear zone in this Precambrian terrane (Fig.1), which exhibits breakneck frictional melt of the charnockites producing brecciated rocks. Large scale emplacement of pseudotachylyte has been observed along this zone.

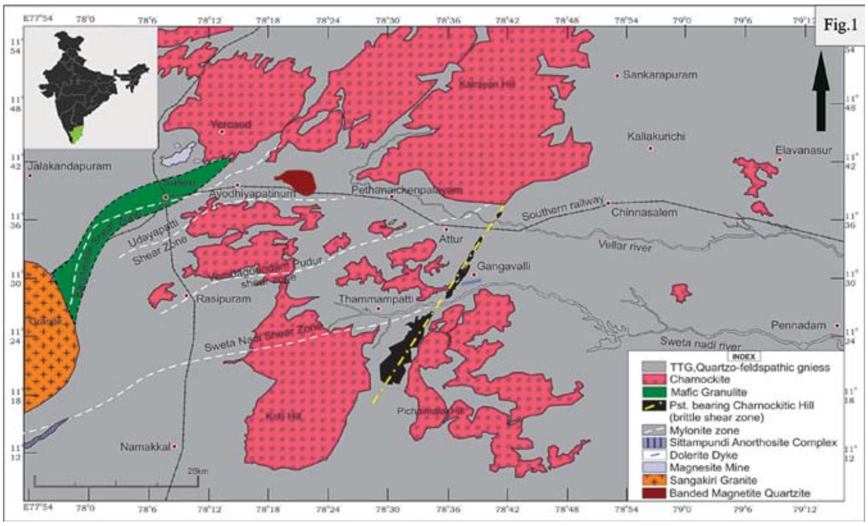

Fig. 1: Regional geology of Salem-Attur shear zone in southern granulite terrane (SGT) showing Gangavalli shear zone (e.g. indicated by NE-SW trending black hills with yellow dashed line), pseudotachylyte bearing charnockite hills. (modified after Sundarlingam, 2013)

The pseudotachylyte veins observed from field visit are thin irregular as well as thick straight vein. The veins occur as a dark material inside the fracture. Its width varies from 1mm to 10cm and length varies from 2 m to 3 m. Many places they are parallel to the wall rock, however narrowing of the width producing swell nature (Fig.2). Clasts of the country rock are enclosed inside the pseudotachylyte vein. Tapering end of the vein indicates the flow direction. The flow character is further indicated by flow folding produced at the contact between branching veins and, the intrafolial pseudotachylytes occur along the foliation plane in the TTG and Charnockite. They vary in width and length and sometimes cut across the foliation plane. Streaky pseudotachylytes are observed due to non-continuity of the pseudotachylyte vein along the foliation. Patchy pseudotachylytes occur inform of irregular patches and having different diameter (10-15 cm). The patches show sharp margins with the country rock and at places cut by later fracture. The dendritic pseudotachylytes occur in form of triangular shapes and thin vein emerge from the vertex of the triangle. Under microscope the pseudotachylyte show sharp margin with the country rock. The color of the vein varies from light brown to dark brown. The clasts show angularity to higher degree of roundness and they have been distributed non-uniformly. Elongated clasts are aligned parallel to the gneissic foliation of the country rock. The pseudotachylyte shows various degree of devitrification resulting microlites of albitic in composition and can be classified into three types namely i) acicular microlites (Fig. 3) ii) sheaf microlites (Fig. 4) and iii) and overgrowth microlites (Fig. 5). They show the flow around the clasts. In sheaf microlites the individual crystal has a central bar and branching out at the tip. They are found at the center of the vein. The overgrowth microlites are grown around the quartz clasts in form of radiating crystal fibres. The clast boundary acts as a nucleus surface. According to Sibson, (1975) classification, the acicular microlites are simple group and sheaf and overgrowth microlites are complex group of microlites.

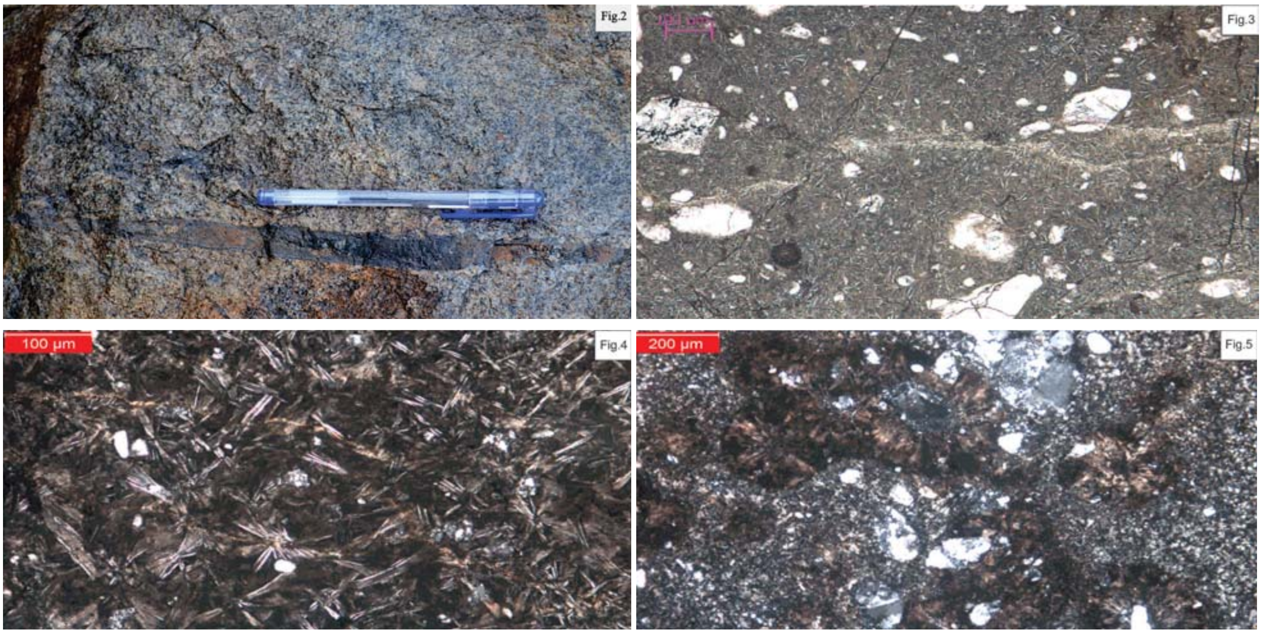

Fig. 2: Pseudotachylyte vein showing swelling nature where both ends are tapered and middle of the vein is achieved maximum thickness. **Fig. 3:** Bright clasts are more rounded and surrounded by needle shaped acicular microlites. This roundness is gain due to grain boundary decrepitation. Acicular microlites show flow texture which indicates its origin during the flow of the melt. **Fig. 4:** Sheaf microlites are having a central bar and fibrous at the both end. **Fig. 5:** Overgrowth microlites: bright clasts are surrounded by brown radiating microlites.

Here, we have made an attempt to map the pseudotachylyte veins along the shear zone and to study its property to understand the mechanism of formation, emplacement history and tectonic of SGT. We have used AutoCAD software to carry out grain size analysis of the clasts, EPMA for chemical composition of the pseudotachylyte matrix, microlites and clast within vein, whole rock analysis of pseudotachylyte vein and country rock. The results indicate high temperature frictional melting of charnockite rock during palaeoproterozoic generated from a compression in NW direction.

Reference

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