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Role of P-T conditions and bulk rock composition in the mineralogical variations in millimeter scale: a study from South Maharashtra Shear Zone, western India

Pallavi Praharaj and Sukumari Rekha
National Institute of Technology, Rourkela, Earth & Atmospheric Sciences, India (pallavi.tina2@gmail.com)

The pressure-temperature conditions are transient in time and space during tectonic processes. To understand the complete P-T history of crustal domains examining the mineral paragenetic sequences and zoning profiles of minerals from diverse lithologies in the domain is necessary. But in highly tectonised crustal domains establishing time equivalence between far-spaced samples is difficult. To overcome this, a mylonite sample with closely spaced layers of different mineralogy collected from the South Maharashtra Shear Zone located along the north of Western Dharwar Craton (Rekha and Bhattacharya, 2014) was studied. The mylonite has four mineralogically distinct layers of few millimeters width containing garnet porphyroblasts of distinct zoning pattern separated by quartz layers. Layer-1 has two domains on the basis of the relative abundance of quartz; Layer-1A with more quartz and less flaky minerals and Layer-1B with less quartz and more flaky minerals. Layer-1A is composed of quartz>biotite>plagioclase>chlorite>K-feldspar with syn- to post-tectonic garnet porphyroblasts and the fabric is defined by shape preferred biotite-chlorite aggregates, recrystallized plagioclase and quartz ribbons.Layer-1B is relatively quartz poor and plagioclase>biotite>chlorite>K-feldspar aggregates rich domain as compared to L1A with biotite-chlorite aggregates and recrystallized plagioclase defined fabric.Prehnite elongated parallel to schistosity present but not very common. Layer-2 is very thin with amphibole-biotite±chlorite defined foliation and consists of plagioclase-K-feldspar-quartz with large garnet porphyroblast ofsyn to post-tectonic origin. Chlorites are mainly present near to garnet. Layer-3 is composed of biotite-calcite-plagioclase-chlorite-quartz with syn/post-tectonic garnet porphyroblast and the foliation is defined by biotite-chlorite aggregates, recrystallize plagioclase, calcite grains aligned parallel to the foliation and elongated quartz grains.Layer-3 is separated from the quartz layers on both sides by the formation of thin hornblende layers arranged parallel to the foliation. Very few hornblende grains found within the layer aligned parallel with the fabric defining minerals. Large pre-tectonic muscovite grains are preserved in Layer-3 and are altered to epidote along the margins of the grain. Layer-4 consists of hornblende, calcite, quartz with few plagioclase, K-feldspar and post tectonic garnet porphyroblast. The fabric is defined by the long axis of amphibole and calcite grains aligned parallel to it. Later biotite-prehnite grains formed at high angle to the fabric defining minerals. Conventional geothermobarometers were used for P-T estimation and it varies from 450-560°C and 6 kbar for Layer-1A, 445-550°C and 7 kbar for Layer-1B, 475-570°C and 6 kbar for Layer-2, 450-575°C and 7-8 kbar for Layer-3 and 450-5500°C

and 7-9 kbar for Layer-4 at reference temperature of 500°C and pressure of 6kbar. Though different layers have distinctly different mineral assemblages there is hardly any variation in the P-T conditions which implies the original bulk rock composition was different for different layers not the P-T conditions of deformation.

Keywords: Mylonite, Western Dharwar Craton, Geothermobarometry