Petrogenesis of the metamorphosed mafic rocks of the Shimoga greenstone belt, western Dharwar craton, southern India

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The Dharwar Supergroup rocks are represented by extensive greenstone belts such as Chitradurga, Shimoga and Bababudan schist belts. These volcano-sedimentary rock sequences were formed and metamorphosed between 2.9 and 2.6 Ga ago. The Shimoga greenstone belt is an extensive basin consisting of metavolcanic and metasedimentary rock associations which include basal polymictic conglomerate, quartzite, pyroclastic rocks, carbonaceous rocks, greywacke-argillite sequences and a thick pile of mafic and felsic metavolcanic rocks. All the rocks of the Shimoga greenstone belt have suffered greenschist to amphibolite grade of metamorphism. While geochemical and geochronological studies exist on the felsic volcanic rocks of the Shimoga greenstone belt, there is a dearth of detailed geochemical and isotope studies on the mafic volcanic rocks. The mafic rocks are predominantly basaltic to andesitic in composition and composed of metamorphosed chlorite-carbonate schists, talc-chlorite schists, hornblende schists, massive metabasalts, amphibolites and minor serpentinized ultramafic rocks. Preliminary geochemical studies on these rocks show significant differences in the trace element distribution. While some show significant negative Nb anomaly with respect to primitive mantle others show negligible anomalies, indicating multiple petrogenetic processes involved in their genesis. All the samples show prominent positive Pb anomaly. The chondrite-normalized rare earth element (REE) patterns show moderate to high contents of REE with a fractionated pattern. Some samples show slight negative Eu anomaly and some do not show any significant anomaly. These again indicate different petrogenetic processes involving melting with either plagioclase or garnet or both in the unmelted residue. The geochemical data are suggestive of subduction related slab melting processes in the generation of the magmatic precursors for the metamorphosed mafic rocks. Further studies involving Sm-Nd isotopes are being undertaken to understand the geodynamic processes for the formation of the rocks of the Shimoga greenstone belt and also to constrain the timing of their emplacement.