GEOCHEMISTRY OF CHARNOCKITES, NORTHERN SRI LANKA

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Charnockite is a major rock type in the continental crust, especially in Sri Lanka. Although several previous studies were carried out around the world, their origin has been controversial, some consider them as igneous and others as metasedimentary. Hence the origin of the charnockitic gneiss in the northern Sri Lanka is of great importance in understanding the tectonic evolution of basement rocks of Sri Lanka. The current study aims to comprehend its petrological and geochemical characteristics.

Mafic and granitic gneisses and quartzites occur as minor interlayered lithologies within the northern charnockite terrain. The modal percentages of quartz, alkali feldspar, plagioclase feldspar, orthopyroxene (hypersthene), biotite and amphibole are highly variable among the studied charnockite samples in the range (%) of 10-35, 10-20, 10-50, 5-10, 3-10 and 5-10, respectively, with few samples containing clinopyroxene amounting to ~5-25 %. Hypersthene show more-or-less similar compositions as those of charnockites reported from the Highland Complex (HC) and elsewhere in the Wanni Complex (WC), whereas clinopyroxenes are more ferroan, in contrast to more magnesian-type reported previously from both HC and WC. Garnet is observed (~2-3%) only in few of the studied charnockites, where symplectites of hypersthene + plagioclase indicate evidence for isothermal decompression, with rare preservation of relict garnet. In these symplectites, garnet-orthopyroxene pairs give metamorphic temperature of ~765 °C at a P of 7 Kbar. Whole rock SiO₂, MgO, CaO, Al₂O₃, Fe₂O₃, Na₂O, K₂O and TiO₂ compositions vary in the range of 46-76 %, 0.05- 6.55%, 0.74- 10.48 %, 10.59- 18.37%, 0.94- 15.07%, 2.96- 5.65%, 0.31-5.59 %, 0.09 -2.45%, respectively. TiO₂, Al₂O₃, K₂O and Na₂O contents show positive correlation trends with SiO₂ whereas, Fe₂O₃, MnO, MgO, CaO, P₂O₅ show steeply decreasing trends with increasing SiO₂ contents. In the AFM diagram, the studied charnockites are indicative of a calc-alkaline trend. Scarce occurrence of typical metasedimentary rocks in the terrain, high abundance of Fe-Mg rich mineral assemblages and whole-rock geochemical trends in the studied samples support a clear igneous origin for the charnockites of northern Sri Lanka.

Keywords: Charnockite, Geochemistry, Wanni Complex, Sri Lanka

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