

Trace and rare earth element geochemistry of the clinopyroxene of dolerite dykes from Western Dharwar craton, southern India

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The late Archean to early Proterozoic mafic dyke swarms of the Western Dharwar craton (WDC) are significant as they represent the nature and composition of Sub-continental Lithospheric Mantle (SCLM). They provide key information regarding the mantle dynamics during the Precambrian and helps to understand the tectonic evolution of the Dharwar craton. Major and trace element zoning of the minerals like clinopyroxenes from these mantle-derived rocks are indicators of magmatic processes like fractional crystallization or magma mixing, melt extraction and compositional evolution [1, 2]. Furthermore, the rare earth element concentrations help to identify the origin and evolution of the mafic igneous rocks.

The major and trace element characteristics of the clinopyroxene from two generations of dolerite and olivine dolerite dykes of Western Dharwar Craton have been investigated by using electron microprobe and LA-ICPMS. The clinopyroxene in dolerite dykes show compositional zoning that are considered to be primary in nature. The major element analysis of the dolerite shows significant differences in Cr concentrations within the clinopyroxene grain. The core is rich in Cr_2O_3 (0.538 wt%) and the rim is poor in Cr_2O_3 (0.007 wt%). There is also a concomitant decrease in Mg# from the core (85) to the rim (51) and Cr_2O_3 content decreases towards the rim. The trace and rare earth element pattern of the core shows a depleted pattern compared to the rim. The dolerites and olivine dolerites are formed from different source magmas and the dolerites have a different fractional crystallization history. The melt composition in equilibrium with clinopyroxene was estimated and they are consistent with the bulk rock geochemical characteristics reported previously [3]. The clinopyroxene in the olivine dolerites, although doesn't show any zoning, is compositionally more primitive than the dolerites as observed by the general trace element and REE concentrations. In the case of dolerites, the Cr-rich clinopyroxene cores preserve the original melt composition prior to fractional crystallization and the trace elements and rare earth element compositions indicate the influence of subducted materials on the mantle source.

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