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Plagioclase Megacrysts in Proterozoic Leucogabbronorite Dyke from Bastar Craton, Central India: Melt-crystal interaction at crustal level.

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Study of mafic dykes provides an excellent opportunity for understanding the magmatic crystallization history, emplacement mechanism, regional geodynamic setting and crustal evolution [1]. In this study, we present the petrological and geochemical characteristics of a rare plagioclase megacrysts leucogabbronorite dyke (PMLGN) from the Western Bastar Craton (WBC). This NW-SE trending 25 to 70 m wide dyke extends for ~14 km and is intrusive into the Archaean TTG-enderbite-charnockite on northern shoulder of Godavari graben. This dyke has undergone varying degree of alteration without any affect of deformation and metamorphism. Nevertheless, its overall texture and relict mineralogy provides important insight into the nature of its parent magma and is suitable for study of emplacement mechanism. Whole-rock composition of dyke shows basaltic affinity, saturated with Al, slightly elevated in Zr and Hf and depleted in Rb, Sr, Nb and Ti. The REE spidergrams shows slightly LREE enriched-HREE depleted pattern. The (La/Yb)CN ratio varies between 6.25 and 9.25 and Eu/Eu* varying between 1.09 and 1.36. Trace element characteristics indicate its emplacement as within plate basalt in continental rift environment.

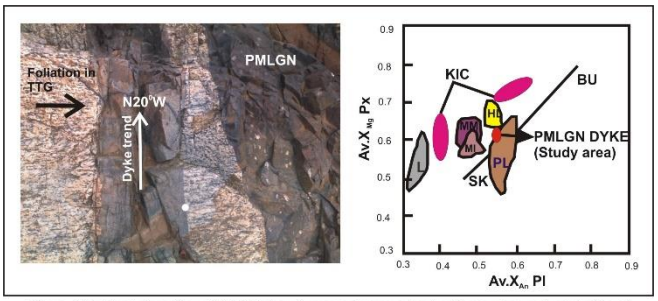

Figure.1 Field relationship of PMLGN showing very sharp contact with country rock and mineral chemistry of average plagioclase vs pyroxene showing similar to proterozoic massive type anorthosite.

An important characteristic of this dyke is the presence of large phenocrysts of plagioclase (~3 to 10 cm) showing resorption and variable zoning pattern in a medium-grained groundmass comprising plagioclase, pyroxenes and rare olivine. Resorption of plagioclase is attributed to melt-crystal interaction due to sudden fall in pressure during emplacement of the dyke. Mineral chemistry of plagioclase megacrysts shows sharp increase in An-content towards the rim. The sharp rise of X_{An} in plagioclase megacryst may indicate that magma ascent was relatively rapid, possibly promoted by crack propagation in the crust during initiation of Godavari rifting. The X_{An} content in plagioclase and X_{Mg} in pyroxene megacrysts is strikingly similar to those from the typical Proterozoic massif-type anorthosites of the world [2](Fig.1). Though the PMLGN is yet not dated, field evidences and chemical dating of monazite by EPMA from adjacent NNW-SSE trending unmetamorphosed mafic dyke suggest its emplacement around 1.9 Ga. This is roughly coinciding with global emplacement age of massif-type Proterozoic anorthosites. This period is temporally linked to mantle plume activity of Large Igneous Province and associated with major episodes of crustal extension that can lead to continental rifting [1]. This dyke was intruded by leuco-granite of 1.4 Ga [3]. The PMLGN dyke show characteristics of High

Alumina Gabbros, and represent the original, less-differentiated liquid derived from the tholeiitic parent. The ascent of magma was associated either with tectonic activity, reactivation of earlier faults or renewed crustal dislocation in Bastar craton. Morphological features like horns and peeling off country rock support emplacement into brittle crust along the pre-existing NW-SE trending fractures parallel to Godavari graven. The emplacement of PMLGN is linked to crustal extensional events of the Paleo-Mesoproterozoic Bastar- Cuddapah Large Igneous Province of India.

References

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