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Zoned crystal cargos in alkaline mafic dykes: evidences for magma chamber plumbing system beneath the Deccan LIP, NW India

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Alkaline magmatism constitutes a minor, yet significant component of the end-cretaceous Deccan Large igneous province (LIP) occurring either as individual intrusive or magmatic suites of plutonic to volcanic rocks forming complexes. A number of lamprophyres dykes intrude the basement rocks and are intrinsically associated with the alkaline complexes in the rift zones of the NW India. Studies have been made on some of these lamprophyres considering them as the primary magmas derived from deep mantle sources to infer the nature of their mantle source region, relative contribution of lithosphere and asthenosphere, plume lithosphere interaction, and tectono-magmatic setting of the Indian plate before, during, and subsequent to the eruption of the Deccan Traps[1]. However, studies pertaining to genesis of lamprophyres as differentiated products and their role as parental magma to rocks of co-spatial magmatic suites in various alkaline complexes in the LIPs in general and those from the Deccan LIP in particular are still unclear and not well understood. Therefore, in order to decipher whether the lamprophyres are a part of the consanguineous magmatism and related to the other intrusions or simply represent primary magmatic products derived directly from the deep mantle source. We have carried out detailed study on lamprophyre dykes from the Mundwara and Phenaimata alkaline complexes of Deccan LIP. The lamprophyre dykes are highly porphyritic rocks, carry different and heterogeneous population of minerals. Investigation of mineral texture and compositional zoning of minerals suggests recycling and accumulation of more primitive crystals within an evolved magmatic composition. Disequilibrium mineral texture and diversity in mineral composition, whole rock and trace element geochemistry demonstrate operation of diverse open and closed system processes such as fractionation, replenishment and crystal mush capturing that have occurred in inter-connected plumbing magmatic chambers beneath the alkaline complexes and their significant role on the formation of lamprophyres as well as on the diverse associated rocks of alkaline complexes and their ultimate bulk rock composition.

References:

[1] Chalapathi Rao et al. (2020) Episodes Journal of International Geoscience, **43**, 231–248.