

Lamprophyres are deep mantle derived ultramafic-mafic, volatile-rich, alkaline igneous rocks, which are widely considered as products of metasomatized (enriched) mantle. Lamprophyres contain high abundances of both compatible as well as incompatible trace elements and some of their occurrences are also known to be economically important hosts of diamond and gold.

Petrographical observations of central India tectonic zone (sidhi) lamprophyres reveals their porphyritic-panidiomorphic texture. Phlogopite-biotite are present as the main phenocryst phases along with olivine, amphibole, pyroxene, feldspar, carbonate, apatite, sphene and spinels are present as groundmass. However, primary olivines are totally replaced by carbonates. SEM study shows presence of zoned micas, sulphides, galena, barite and monazites apart from microscopic study. EPMA study reveals presence of Ba rich Feldspars, Fluoro-apatite, pyrite-chalcopyrite. Multiple generation of these phenocrysts suggest repeated degassing and recharge of magma and high TiO_2 content of macrocrystic mica reflects high titanium content of parental magma. Bulk-rock geochemistry reveals them to be intermediate to undersaturated, mafic-ultramafic, potassic-ultrapotassic, non-peralkaline to border peralkaline, metaluminous in nature and these lamprophyres occupy the field of calc-alkaline series. Whereas, high MgO (> 6 wt%) and moderate to high Mg# (60-68) suggests involvement of primary magma and mantle origin. The primordial mantle normalized trace element plot shows enrichment of incompatible trace elements, whereas Chondrite-normalized REE patterns show high fractionation and extreme enrichment in LREE. High La/Yb indicate moderate degree of fractionation and positive correlation in La/Yb vs La diagram indicates that in the compositional variation of the sidhi lamprophyre major role is played by partial melting. Bulk-rock LREE, Hf/Sm_N and Ta/La_N signatures are indicative of fluid related subduction metasomatism experienced by their source region and is further supported by Nb, Ta and low TiO_2 contents, which is in accordance with that of subduction-zone generated potassic magmas with essentially low titanium contents. Central Indian lamprophyres are thus considered as manifestation of subduction derived metasomatized lithospheric mantle.