

Mineralogy, geochemistry and petrogenesis of lamprophyres from Central Sakarya Region (NW Anatolia, Turkey)

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Lamprophyres are relatively uncommon alkaline, silica-undersaturated, small volume hydrous ultrapotassic igneous rocks often found as dikes or small intrusions. Paleozoic schists and the late Carboniferous Sogut granodiorite in Central Sakarya (NW Anatolia) are cut by NE-SW trending minor dyke intrusions of camptonite (alkaline lamprophyre) and lamprophyre.

The rocks contain abundant phenocrysts of amphibole, clinopyroxene, plagioclase, nepheline, olivine and opaque minerals. Amphibole phenocrysts range in size from mm to 1-2 cm; lamprophyre amphiboles are calcic (pargasite) and the camptonites contain both pargasite and kaersutite. Pyroxene in the lamprophyres is subalkaline-alkaline augite, while that in the camptonites is alkaline to peralkaline ferroaugite. Plagioclase feldspar compositions range from An₅₃₋₇₇ in the lamprophyres and An₃₄₋₅₆ in the camptonites.

The whole rock chemistry indicates that lamprophyres are subalkaline (tholeiitic), whereas the camptonites are alkaline in character. SiO₂ contents of the camptonite and lamprophyre samples are different (46 and 53-63 wt%, respectively). Mg-numbers of the lamprophyre samples range between 20-31; but are higher 38 in camptonite.

Linear decreasing trends of CaO, MgO, Fe₂O₃, Ni, Sc and Cr with decreasing Mg-number suggest fractionation of plagioclase, amphibole, pyroxene and olivine. Ti-Zr-Y variations indicate that the dikes formed in a within-plate environment, and enrichment in LREE, LILE and HFSE over ocean island basalt indicate the source region may be located in the mantle lithosphere. The lack of negative anomalies in Nb, Ta, P and Ti in primitive mantle normalized ITE diagrams suggests partial melting of metasomatized garnet peridotite. We infer the lamprophyres reflect metasomatism associated with slab-derived fluids and melts at the earliest stage of slab-rollback and southwestward migration of the subduction zone now located in the westernmost Aegean Sea. The timing of this modification is as yet unknown, and may date from formation of the Sakarya Complex in Late Triassic.