Petrochemistry of Early Eocene Lamprophyre Dykes, NE Turkey

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Early Eocene lamprophyre dykes located in the Çaykara, Hayrat and İkizdere areas from the NE Turkey can be divided into two subgroups as amphibole-bearing (spessartites) and biotite-bearing (kersantites) types. U-Pb zircon ages (~42-48Ma) indicate that the lamprophyres intruded into late Cretaceous-early Cenozoic granitoidic rocks in the region were emplaced in early Eocene time. These dykes have no signs of deformation and metamorphism and their thickness vary from 0.2 to 5m with visible length from 3 to 20m. The lamprophyres have generally lamprophyric and porphyritic textures with phenocrystal paragenesis of Plag+Amp±Cpx in the spessartites and Plag+Bi±Amp±Cpx in the kersantites. Plagioclase and amphibole in the spessartites are oligoclase to bytownite (An_{17-83}) and mostly magnesio-hastingsite to edenite-pargasite in composition, respectively, whereas those from kersantites are oligoclase to andesine (An_{13-63}) and magnesio-hastingsite in composition, respectively. Clinopyroxenes in both lamprophyre groups are diopsidic in composition with Mg# [$Mg/(Mg+Fe^{+2})$] of 0.66-0.87 and biotites in the kersantites are Mg-rich phlogopites with Mg# of 0.64-0.75. According to the mineral- and rock-chemical classification diagrams, the lamprophyres are calc-alkaline with a variable contents of SiO_2 (44-57 wt%), TiO_2 (0.6-2.3 wt%), Al_2O_3 (12.5-18 wt%), CaO (7-13 wt%), Na_2O (2.0-3.7 wt%), K_2O (0.8-2.4 wt%), Ni (1-148 ppm), Nb (5.5-32 ppm), Zr (84-173 ppm) and Ba (389-792 ppm), and Mg# [$Mg/(Mg+Fe^{+2})$] of 0.45-0.73. Based on the primitive mantle and chondrite-normalized spider and REE diagrams, the lamprophyres are enriched in LILE and LREE relative to the HFSE and HREE, and show a distinct negative Nb and Ti anomalies. Nb/La ratios (<0.6) and Sr-Nd-Pb isotopic compositions (ε_{Nd}=+0.9 to +2.9; I_{Sr}=0.7046-0.7053; $^{206}Pb/^{204}Pb$=18.4-18.8; $^{207}Pb/^{204}Pb$=15.61-15.62; $^{208}Pb/^{204}Pb$ =38.61-38.84) indicate that the lamprophyres probably derived from an enriched subcontinental lithospheric mantle with a low degree of partial melting. All geochemical findings combined with regional geological data suggest that the lamprophyric dykes formed in early phase of the rifting within a magmatic arc setting related to post-collisional extentional tectonic regime during early Eocene.

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