



High to ultrahigh potassic alkaline volcanic belt along the Ankara-Erzincan suture (northern Turkey): new geochemical and Ar-Ar data constraining petrogenesis with implications for the late Cretaceous subduction of the Neotethys Ocean

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Remnants of some high- to ultrahigh-K alkaline volcanic rocks crop out as isolated small and discontinuous bodies along the Ankara-Erzincan suture belt in northern Turkey. These rocks are represented by leucite-bearing lavas (LB), basaltic andesites, trachytes, monzonite/syenites) and lamprophyres. Leucite-bearing rocks are small stocks, dikes and lava flows. Pebbles and blocks of the LB are found in the coeval volcanic debris avalanche deposits and volcanoclastic breccias. Leucite-bearing rocks are mainly phonotephrite, tephriphonolite, trachyandesite and basaltic trachyandesites (shoshonite) and have mineral assemblages of lct + cpx + ol + pl + Kfs + mag + ap. Leucites were almost totally analcimized. Trachytes and monzonite/syenites, which are seen as small stocks and dikes, are characterized by amp + bt + pl + Kfs + spn + ap + opq paragenesis. Lamprophyres are mica-rich melanocratic dikes, and include cpx + mica (phlogopitic) + Kfs + ap + opq. Rarely leucite, olivine and plagioclase are also present. Ar-Ar data reveal that this volcanic activity occurred between 73.6 ± 0.18 and 76.78 ± 0.19 Ma, corresponding to latest Cretaceous.

All the samples from the high- and ultrahigh-K volcanic belt are alkaline in nature. Leucite-bearing lavas are characterized by their MgO (2.70-5.81, av. 4.58 wt.%), K₂O (0.79-4.81, av. 2.35 wt.%), Na₂O (4.86-7.48, av. 3.58 wt.%) and K₂O/Na₂O (0.13-0.92, av. 0.42 wt.%). The low K₂O and K₂O/Na₂O contents of these rocks are due to extensive analcimization of the leucites. Major oxide contents in lamprophyric rocks are 3.25-7.48 (MgO), 1.35-7.76 (K₂O), 1.77-4.00 (Na₂O) and 0.31-2.69 (K₂O/Na₂O). The silica content of these rocks are variable and range from 47.18-50.26 (wt.%) (LB) to 39.14-53.28 (lamprophyres). Based on their major element contents, these rocks are classified as plagioclitites or ultrapotassic rocks of the active orogenic zones (Foley, 1992).

Leucite-bearing rocks, lamprophyres and the trachytes (with their hypabyssal equivalents) display similar geochemical behavior. Their typical features are high LILE relative to HFSE, and Nb-Ta and Ti depletions on the P-MORB normalized plots. In the lamprophyre group, Hf and Zr depletions are also evident. Mg# for all the rock series are highly variable (34 – 60), implying that these rocks formed from evolved melts. Considering the Ar-Ar ages, Nb-Ta depletions, LILE enrichments, some inter-elemental ratios and the geological evolution of the Ankara-Erzincan suture belt, we conclude that the late Cretaceous alkaline high- to ultrahigh-K magmatic products are common in space, time and origin in this region. All the rock groups were derived from partial melting of lithospheric mantle modified by subduction-related fluids, and from the melting of the subducted crustal material. Additionally, lamprophyric melts were possibly generated from the melting of veined SCLM. Veins were probably rich in phlogopitic mica and clinopyroxene. We propose that this alkaline high- to ultrahigh-K volcanic belt is the product of subduction-related magmatism, and resulted from northerly subduction of the Neotethyan Ocean crust during the latest Cretaceous period.