



Geochemistry and petrogenesis of the late Cretaceous potassic-alkaline volcanic rocks from the Amasya Region (northern Turkey)

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The Cretaceous Lokman Formation (Alp, 1972) is a volcano-sedimentary unit that comprises high- to ultra high-K alkaline volcanic rocks in Amasya Region (40°N, 35°E). The volcanic rocks expose as small outcrops and interfingered with pyroclastic and epiclastic rocks, and are classified as leucitite, tephriphonolite (LT), lamprophyres, trachytes and rarely andesites. LT and lamprophyres occur as dikes cutting each other, and rare lava flows. Trachytes are observed as small domes in the field and lots of pebbles and blocks within the clastic deposits derived from the domes.

Samples of LT comprise lct+cpx (diopside)+plg+mag+ap and classified as leucite-basanite mineralogically and tephri-phonolite geochemically. Ar-Ar age dating from leucites show that the leucite-bearing volcanic activity formed 75.6 ± 3.7 Ma. The mineralogic composition of melanocratic lamprophyre dikes are represented by Kfs+cpx+mica+ap+mag. They defined geochemically as phono-tephrite and phonolite. The Ar-Ar plateau ages from the phlogopites from two different outcrops are 76.78 and 77.48 Ma. The main minerals of trachytic rocks are amp + bt + pl + Kfs + spn + ap + opq. They are classified as alkaline trachyandesite, geochemically. Radiometric age data from Kfs minerals reveal that the trachytic volcanism occurred 75.83 ± 0.09 Ma.

Except one andesitic sample, lamprophyres and trachytes of the Lokman Formation are the high- and ultra high-K and alkaline rocks. LT and lamprophyres are characterized by relatively high MgO (3.25-7.04 wt.%), K₂O (4.34-6.54 wt.%), Na₂O (3.42-5.74 wt.%). Total analcimization of leucite minerals led to decreasing its K₂O, and increasing the Na₂O contents. Therefore, K₂O/Na₂O values for LT and the lamprophyres (0.92-2.27) are relatively low. Trachytic suite is also high-K and alkaline in nature. On MORB normalized plots, all of the volcanic rocks from Lokman Formation display enrichment of LIL elements significantly relative to HFSE, and depletions of Nb-Ta and Ti elements. Mg# (44.78 – 62.24), FeO (4.74-7.80 wt.%), Nb (6.3-14.4 ppm) and Ni (20-81 ppm) contents of these rocks imply that these rocks were not originated directly from the primitive melts. The geochemical findings suggest a source that is similar with subduction-related magmas.

The evaluation of the geological data and combined with the geochemical findings suggest that the high- to ultrahigh-K alkaline volcanic rocks of the Lokman formation were generated by the partial melting processes of a heterogeneous magma source that was modified by the subduction of the Neo-Tethys ocean during the late Cretaceous period.