Petrology of the Neotethyan ophiolitic basalts and dykes (Çorum-Turkey): New insights

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Geochemical studies on minerals provide precious knowledge in igneous petrology. However, mineral chemistry studies are too scarce in petrological description of ophiolitic units of İzmir-Ankara-Erzincan-Suture-Zone (IAESZ) that is derived from the northern branch of the Neotethyan Ocean. In this study, basalts and dykes from Ankara Ophiolitic Mélange outcropping in Çorum (Turkey) region are described in terms of their field, petrographical and geochemical signatures.

In the study area, ophiolitic mélange units of IAESZ are tectonically overlied by metamorphics of Sakarya Composite Terrane (SCT), and they are unconformably covered by Upper Neocene sediments. Pillow structured basalts are mostly fresh but show low grade metamorphism restricted to tectonic contact with units of SCT. Mafic dykes are doleritic.

Collectively, all of mafic rocks are characterized by feldspar and abundant pyroxene. Reddish augitic pyroxene is the first crystalizing phase. Moreover, both augite and plagioclase commonly show compositional zoning, twinning, corrosion, resorption with spongy cellular texture, reaction rim and tailing properties, and overgrowth of finer grained augite crystals around the phenocryts in matrix.

Whole-rock geochemistry with Sr-Nd isotope data infer that the rocks display features of alkaline character generated in a transitional environment between E-MORB and OIB. They are evolved from a magma of DMM and EMI mixture.

Detailed Electron Microprobe (EMP) data revealed that phases are augite and albite±K-feldspar. Moreover, minerals show similar compositions among different rock types. Elemental plots for pyroxenes broadly display at least three trends. Pyroxene rims and microcrysts in matrix are characterized by enrichment in Al-Mg. The data also indicate that the mafics have a transitional character from subalkaline to alkaline, and generated in a non-orogenic environment.

Collectively, the present data strongly infer evolution of rocks from similar enriched source and at least three melt influxes into magma chamber during crystallization. The last replenishment, mainly observed as glassy matrix, is Mg-rich with alkaline affinity that control the whole-rock chemistry.