

GEODYNAMIC EVOLUTION OF THE SABZEVAR ZONE, NORTH OF THE CENTRAL IRANIAN MICROCONTINENT

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ABSTRACT

The Northern Central Iranian Micro-continent (CIM) represents Neotethys-related oceanic crust remnants, emplaced due to convergence between CIM and Eurasia plates during Eocene. Mafic and ultramafic units are exposed along the northern part of the CIM in the Sabzevar area. The geology and field relation of Sabzevar ophiolite indicate northward subduction of the Sabzevar basin. The average whole rock chemistry of mafic (gabbros) and ultramafic samples (lherzolite, harzburgite and dunite) is characterized by a range of MgO of 11.16-31.88, CaO 5.22-11.53 and Al₂O₃ 2.77-14.57, respectively. Low LREE/HREE ratio of ultramafic samples is accompanied by enrichment of large ion lithophile elements (LILE) such as Sr, Pb and K. Mafic samples show two distinct groups with low and high LREE/HREE ratios. The spider diagram of mafic samples indicates enrichment in Sr, Pb and K and depletion in REE. Petrological and geochemical evidence and field relations show that the mafic rocks formed in a supra-subduction zone setting. Petrological studies reveal the role of fractional crystallization and assimilation effect by released fluids during subduction related generation of the Sabzevar mafic rocks. We suggest that the studied mafic rocks likely represent the basement of an initial island arc, which was generated in a supra-subduction zone setting within the Neotethys branch of the Sabzevar Ocean at the north of CIM. Copper, gold and chromite mineralizations are studied in relation to island arc setting and supra-subduction environment. Similarities in lithology, ophiolite age and mineralization between Sabzevar ophiolite and Bardaskan-Torbat Heydariyeh ophiolites testify for their separation due to rotation (or faulting) of the Central Iranian Micro-continent.

Keywords: Supra-subduction zone, Ophiolite, Island arc, Mineralization, Neotethys, Iran