Magma genesis in the supra-subduction zone of the Piranshahr ophiolite complex based on the mineral chemistry of clinopyroxene in the North West basalts of Iran

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Abstract: The Piranshahr ophiolitic complex is located in NW Iran, and at north west of the Piranshahr town. Tectonically, the NW Piranshahr ophiolitic complex is severely mélangé and the boundary of different units in this complex is undistinguishable. Piranshahr ophiolite includes ultramafic, mafic, sedimentary and metamorphic rocks. Mafic rocks with basalt and diabase compositions are exposed in several parts of the region. In this paper, clinopyroxene geochemistry of basaltic rocks are studied and compared with the similar rocks from other supra-subduction zone-type of Eastern Mediterranean ophiolites. Clinopyroxenes display diopsid compositions within the range of \((E_{n0.39-0.59} F_{s0.01-0.05} W_{0.50-0.57})\), calc-alkaline nature with low Ti and high Mg content. High-Mg and low-Ti magma suggest a supra-subduction zone setting for the formation of the Piranshahr ophiolitic basalts. According to the distribution of aluminum in clinopyroxenes, these minerals have formed at high oxygen fugacity and water content about 10 percent. The clinopyroxenes of the Piranshahr Ophiolite have similar chemical compositions to those of the other supra-subduction zone-type Eastern Mediterranean ophiolites (e.g., Troodos, Varinous, Pindos and Oman ophiolites) that show arc affinity.

Keywords: Supra-subduction; arc magmatism; Piranshahr; basalt; clinopyroxene.