

Chemical Composition, Petrology and P-T Conditions of Ti-Mg-Biotites within Syenitic Rocks from the Lar Igneous Suite, East of Iran

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Abstract : The Lar Igneous Suite (LIS), east of Iran, is part of post collisional alkaline magmatism related to Late Cretaceous-mid Eocene Sistan suture zone. The suite consists of a wide variety of igneous rocks, from volcanic to intrusive and hypabissal rocks such as tuffs, trachyte, monzonite, syenites and lamprophyres. Syenitic rocks which mainly occur in a giant ring dike and stocks, are shoshonitic to potassic-ultrapotassic ($K_2O/Na_2O > 2$ wt.%; $MgO > 3$ wt.%; $K_2O > 3$ wt.%) in composition and are also associated with Cu-Mo mineralization. In this study, chemical composition of biotites within the Lar syenites (LS) is determined by electron microprobe analysis. The results show that LS biotites are Ti-Mg-biotites (phlogopite) which contain relatively high Ti and Mg, and low Fe concentrations. The $Mg/(Fe^{2+} + Mg)$ ratio in these biotites range between 0.56 and 0.73 that represent their transitionally chemical evolution. TiO_2 content in these biotites is high and in the range of 3.0-5.4 wt.%. These chemical characteristics indicate that the LS biotites are primary and have been crystallized directly from magma. The investigations also demonstrate that the LS biotites have crystallized from a magma of orogenic nature. Temperature and pressure are the most significant factors controlling Mg and Ti content in the LS biotites, respectively. The results show that the LS biotites crystallized at temperatures (T) between 800 to 842 °C and pressures (P) between 0.99 to 1.44 kbar. These conditions are indicative of a crystallization depth of 3.26-4.74 km.

Keywords : sistan suture zone, Lar Igneous Suite, zahedan, syenite, biotite

Conference Title : ICMGP 2019 : International Conference on Mineralogy, Petrology, and Geochemistry

Conference Location : Paris, France

Conference Dates : July 18-19, 2019