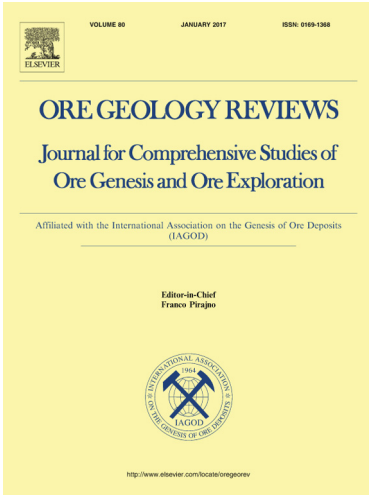

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Geochemistry and potential resource of rare earth element in the IOA deposits of Tarom area, NW Iran

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Abstract

Iron Oxide-Apatite deposits (IOA) have been found and investigated in the Tarom district, NW Iran. This area is a part of the Cenozoic Alborz-Azarbaijan magmatic belt in the foreland of the Arabia–Eurasia collision zone of the Alpine-Himalayan Orogen. In this region, volcanic and volcanoclastic rocks (Karaj Formation) are the main units which were later followed by the intrusion of late Eocene plutonic rocks. These intrusions are metaluminous I -type granitoids and have high- K calc-alkaline to shoshonitic affinity. The IOA deposits are mainly hosted by quartz monzonitic rock. These deposits occur as veins and veinlets with brecciated, banded and massive textures. Mineralogicaly, the IOA deposits are composed of magnetite, apatite, monazite, actinolite, clinopyroxene, pyrite, chalcopyrite, quartz and calcite. Rare earth element mineralization in the Tarom area is related to the IOA deposits. These elements are mainly concentrated in apatite crystals. Exploration studies indicate REE grades up to 1% in apatite crystals and up to 0.7% in the magnetite-apatite ore. These studies demonstrate that LREEs are more enriched compared to HREEs in magnetite- apatite ores, while actinolitic zones have less enrichment of LREE/HREE. Chondrite normalized REE patterns of IOA ores in the Tarom area are similar and show strong LREE/HREE fractionation and negative Eu anomaly. These similar REE patterns indicate that these units have a common origin. Magnetite- actinolite ores and actinolitic zones indicate flat patterns with low fractionation of LREE/HREE along with negative Eu anomaly. REE patterns of IOA deposits in Tarom area are similar to that of Kiruna- type Fe deposits. Furthermore, comparison of chondrite-normalized REE patterns of IOA ores with those of quartz monzonite host rock indicating very similar patterns. These similar patterns demonstrate that the mentioned quartz monzonitic intrusions and IOA deposits originated from a common magmatic source.

Keywords: Geochemistry, IOA deposit, REE mineralization, Tarom, Zanjan

1- Introduction

There are 17 rare earth elements (REEs), 15 within the chemical group called lanthanides, plus yttrium and scandium (Walters et al., 2011; Humphries, 2013). The rare earth elements are commonly found