Mineralogy and geochemistry of trace and rare earth elements of the Borhan ferrite ores, southeast of Mahabad, NW Iran

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Abstract: Residual layers and lenses of the Borhan area (SE Mahabad, NW Iran) contain considerable volume of ferrite ores, which are surrounded by carbonate rocks of the Ruteh Formation of Permian age. Petrographic examinations show that these ores have polycyclic nature and allogetic origin and their evolution is largely affected by the diageneric and epigenetic processes. Mineralogical studies reveal that hematite and goethite are the major mineralogical phases, accompanied by minor phases such as kaolinite, illite, boehmite, rutile, calcite, pyrolusite and crandalite. Based on semi-quantitative values of minerals, the studied ferrites have iron ore and Si-rich iron ore. Geochemical investigations suggest that distribution of most trace elements in the ores was controlled by the Fe-Al differentiation degree. REEs values vary from 10.80 to 145.07 ppm in the ores. La/Y, Eu/Eu* and Ce/Ce* values in the ores are within the ranges of 1.00-10.4, 22.29-5.65 and 3.63-5.22, respectively. The combination of the obtained mineralogic and geochemical results reveal that environmental conditions (oxidant-basic) and mineralogical control have played the important role in fixation of trace elements in the ferrite ores. Correlation coefficients among elements indicate that minor mineralogical phases such as clays, boehmite, pyrolusite, rutile and crandalite are the potential hosts for REEs in the ores.

Keywords: Ferrite; trace elements; mineralogical control; oxidant-basic environment; Borhan; Mahabad.