

Petrology Investigation of Apatite Minerals in the Esfordi Mine

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Abstract : In this study, apatite minerals from the iron-phosphate deposit of Yazd have been investigated within the microcontinent zone of Iran in the Zagros structural zone. The geological units in the Esfordi area belong to the pre-Cambrian to lower-Cambrian age, consisting of a succession of carbonate rocks (dolomite), shale, tuff, sandstone, and volcanic rocks. In addition to the mentioned sedimentary and volcanic rocks, the granitoid mass of Bahabad, which is the largest intrusive mass in the region, has intruded into the eastern part of this series and has caused its metamorphism and alteration. After collecting the available data, various samples of Esfordi's apatite were prepared, and their mineralogy and crystallography were investigated using laboratory methods such as petrographic microscopy, Raman spectroscopy, EDS, and SEM. In non-destructive Raman spectroscopy, the molecular structure of apatite minerals was revealed in four distinct spectral ranges. Initially, the spectra of phosphate and aluminum bonds with O₂H₂O, OH, were observed, followed by the identification of Cl, OH, Al, Na, Ca and hydroxyl units depending on the type of apatite mineral family. In SEM analysis, based on various shapes and different phases of apatites, their constituent major elements were identified through EDS, indicating that the samples from the Esfordi mining area exhibit a dense and coherent texture with smooth surfaces. Based on the elemental analysis results by EDS, the apatites in the Esfordi area are classified into the calcic apatite group.

Keywords : petrology, apatite, Esfordi, EDS, SEM, Raman spectroscopy

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