Mineralogy and trace elements geochemistry of argillic alteration zone: the Zamin Hossein district, Kerman Province, SE Iran

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Abstract: The Zamin Hossein district is located about 170 km southeast of Kerman city in the Dehaj-Sarduieh metallogenic belt, SE Iran. Interaction of hydrothermal fluids with volcanic rocks (mainly andesite) of the Lower Eocene age in this district accompanied with occurrence of an extensive alteration system. The hydrothermal alteration system of the district includes argillic, phyllic and propylitic alteration zones. On the basis of microscopic observations, chalcopyrite, magnetite, pyrite, hematite, goethite, malachite and azurite are the most important minerals in the mineralized veins and veinlets of the argillic alteration zone. Mineralogical studies indicate that the argillic alteration zone contains minerals such as quartz, kaolinite, montmorillonite, muscovite-illite, jarosite, hematite, goethite, albite, orthoclase and calcite. Calculations of the mass changes of trace elements, assuming Al as the monitor immobile element, show that the process of conversion of andesitic rocks into argillic alteration zone accompanied with enrichment of elements such as U, Ba, Nb, Ga, Th, Sr, Sc, Ta, Th and Mo, and depletion of elements such as Th, Co, Cs, Rb, V, Pb, Ni, Cu and Zn. Other trace elements, such as Hf, Y, Zr, and REEs, have undergone both leaching and fixation processes during development of the argillic alteration zone. The distribution pattern of normalized REEs to chondrite implies differentiation and enrichment of LREEs ratio to HREEs and occurrence of weak negative Eu anomaly during development of the argillic alteration zone. Combination of the obtained results from mineralogical studies, geochemistry of mass changes, and investigation of correlation coefficients between elements reveal that the behavior of trace elements during the development of argillic alteration zone in the Zamin Hossein district is a function of factors such as changes in temperature and chemistry of solutions involved in alteration, differences in alteration intensity, adsorption by clay minerals, scavenging by metallic oxides and hydroxides, and fixation in the neomorph mineral phases.

Keywords: Argillic alteration; mineralogy; trace elements geochemistry; Zamin Hossein; Sarduieh; Iran.