Discrimination between mineralized and unmineralized alteration zones by using surfacial geochemical and primary halos of the Darreh-Zar porphyry Cu-Mo deposit, southeast Iran

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The Darreh-Zar porphyry Cu-deposit, a part of the large Alpine – Himalayan belt, is located in the central Iranian sedimentary-volcanic belt. The resources of the ore are estimated of 500 Mt grading 0.35% Cu. The rocks exposed in this region consist predominantly of granodiorite porphyry successively intruded into the basaltic volcanic rocks. As a consequence of the granodioritic intrusion, five different alteration facies including potassic, propylitic, chlorite-sericite, sericitic and argillic with remarkable variations in REE's and other trace elements behaviour, were developed. Potassic alteration discriminated from other facies by enrichment of Mg, K, Li, P, Sc, Ni, Cr and remarkable depletion of W, whilst propylitic alteration differentiated by notable increasing of Mn, V and Ca. Sericite alteration is associated with marked improvement in $(Gd/Yb)_{cn}$, $(La/Yb)_{cn}$, $(La/Sm)_{cn}$ and sharp drop of Eu/Eu* made discrete sericitic zone from the other alterations. In this zone, Nd, Pr, La and Ce are about two times much more as compared with the host rocks. Obvious depletion of Na_2O, Ce, Eu/Er and REE's separates argillic alteration from the others. Despite fluctuations observed among elements behaviour, some paradigm recognized between mineralized and barren alteration zones. The mineralized area distinguished by depletion of Co, V, Ti, P, as well as MREE's and HREE's (e.g. Gd, Tb, Er, and Dy), and marked enrichment of Se, S and LREE's. HFSE's completely mobilize during hydrothermal alteration except for propylitic zone which indicates fluctuate behaviour. Ce/Ce* ratio does not show remarkable feature between mineralized and unmineralized alterations. Enrichment of Cu whilst the other transition elements completely depleted in chlorite-sericite and sericite alterations may shows exploration key which implies mineralization occurred in the area. Supra haloes in mineralized altered rocks are generally described by positive correlation between Cu, Mo, Se, Sn, Sb and LREE's, and negative correlation with MREE's and HREE's.