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Investigation of geochemical and diagenetic processes in copper-bearing sedimentary layers in Chehregan, NW Iran

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Abstract
Chehregan area is located in ∼10 km west of Tasuj, East-Azarbaidjan province. Lithologic units in this area have coarse-grained clastic-continental facies of Tertiary age and underlain unconformably by older formations. The clastic-continental units begin with various kinds of marls (gray to green, gray to brown, and gypsiferous) overlain by a series of clastic (shale, siltstone, marl, sandstone, and conglomerate) and clastic-carbonate (green calcareous shale, sandstone, and green to gray siltstone) units. The copper-bearing layers varying in thickness from a few centimeters to ∼10 meters are within parts of sandstone, green to gray siltstone, and conglomerate.
Quartz, k-feldspars, plagioclase, biotite, muscovite, chlorite, calcite, dolomite, goethite, pyrite, chalcocite, covellite, malachite, pyrobitumen are the main constituent minerals in alteration and mineralization zones.
Alteration of clastic sediments occurred mainly during diagesis. Two conspicuous diagenetic alteration zones were developed at Chehregan; (1) oxidized (reddened) and (2) leached (bleached). Reddening occurred at early diagenetic stage while brown sediments interacted with oxidizing pore solutions. This process is manifested by the presence of widely spread red-colored rocks so called Upper Redbeds in the area. Bleaching took place within red beds at late in diagenetic stage while the passing of reducing solutions (due to the presence of organic matters within the paleochannels) dissolved and leached the preexisting iron oxides (rendering red color to sediments) yielding a gray color layer along the conduit.
Copper mineralization was developed as lenticular forms within the bleached and leached alteration zones. The important factors controlling the development of this zone are the presence of abundant pyrite and fragments of organic matters (fossil plants of continental origin) as reducing agents and also the permeability of the host rocks that facilitate the passage of oxidizing copper-bearing solutions.
Keywords: Chehregan, Diagenetic alteration, Redbed-type copper mineralization, Geochemistry of stream sedimenst.