Investigation of mineralization, alteration, and fluid inclusions of the Takht-e-Gonbad copper deposit (northeast of Sirjan, SE Iran)

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Abstract: The Takht-e-Gonbad copper mineralization is located about 63 km of northeast of Sirjan city. Hypogene mineralization occurred as stockwork vein-veinlets and thick quartz veins hosted by Oligo-Miocene micro-granodiorite body and Eocene pyroclastic materials (mainly tuff with intermediate composition). The stockwork vein-veinlets contain three generations of mineralization, (1) quartz + magnetite ± chalcopyrite, (2) quartz + chalcopyrite + pyrite + magnetite, and (3) quartz + pyrite + chalcopyrite. Phyllic alteration was mainly developed in the wall rocks around the stockwork quartz vein-veinlets. The supergene mineralization in this deposit is characterized by the replacement of ferrous sulfides by hematite and goethite. Also, formation of the malachite, azurite, and native copper during destruction of the hypogene iron and copper sulfides occurred under oxidizing conditions. The study of the fluids inclusion in quartz crystals of the stockwork vein-veinlets showed that they are chiefly of L+V+S, L+V and V+L types having temperature and salinity ranges of 140-450°C and 0.35-57.8 wt% NaCl eq., respectively. The solid phases are halite, sylvite, and opaque minerals. The studied fluids inclusion in the thick quartz veins are of L+V type having temperature and salinity within the range of 207-344°C and 0.35-3.39 wt% NaCl eq., respectively. Based on microthermometric data, the boiling of the magmatic fluids was the effective factor of the ore and gangue minerals deposition in the stockwork vein-veinlets. Also, cooling and mixing of the atmospheric fluids with magmatic ones account for the deposition of the minerals in the thick quartz veins. In general, the obtained data in this research revealed that the development and evolution trend of the hydrothermal system in the Takht-e-Gonbad is mostly similar to that of the porphyry copper system.

Keywords: Takht-e-Gonbad; Kerman copper belt; mineralization; alteration; fluid inclusion; porphyry copper.

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