

## Mineralogy, geochemistry, and fluid inclusion studies in Zaveh copper mineralization occurrence, southeast of Torbat-e-Hydarieh

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**Abstract:** Zaveh copper mineralization is located SE of Torbat-e-Hydarieh in Khorasan Razavi Province, in Khaf-Kashmar-Bardaskan Metallogenic Zone. Geology of the area includes Jurassic and Cretaceous sedimentary rocks and Eocene andesitic to rhyodacitic volcanic rocks. Mineralization is structurally controlled and occurred as vein-veilet form with east-west trending and hosted by Jurassic silicate-cemented conglomerate. Primary minerals are chalcopyrite, pyrite, and arsenopyrite and secondary minerals include malachite, azurite, chalcocite, covellite, bornite, copper sulfates, wad (hydroxide manganese), hematite, goethite, jarosite, limonite, and minor chrysocolla. Quartz is the most important gangue mineral associated with vein mineralization. Primary minerals often seen with vein-veilet and disseminate texture and secondary minerals mostly have vein-veilet and secondary substitution texture. Silicification is the dominant alteration associated with vein mineralization. Mineralization has anomaly of Cu (max 2.1%), As (up to 1%), Sb (105 ppm), Pb (4371 ppm), and Zn (max 1.1%). Based on two-phases (LV) fluid inclusion studies in quartz mineral, minimum formation temperature of mineralization is 310 to 387°C. It is formed by NaCl and CaCl<sub>2</sub>-bearing fluid with 8.1 to 15.8 wt. % salinity. Two isothermal fluid with different salinity played role in the formation of mineralization. Ore-fluid with 14 to 16 wt. % salinity, which itself resulted from mixing of magmatic and meteoric water, was mixed with another fluid with the same temperature range but lower salinity (between 8-9 wt. % salinity). Reduction of temperature can be important factor for sulfide deposition. Host rock, structural control of mineralization, alteration type and development, moderate temperature and low salinity of ore-fluid, and simple mineralogy of Zaveh mineralization is similar to hydrothermal vein-type deposits.

**Keywords:** *Hydrothermal vein mineralization; silicate-cemented conglomerate; fluid inclusion; geochemistry; Zaveh; Torbat-e-Hydarieh.*

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