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Chahmesi Vein-Type Polymetallic Deposit, Urumieh-Dokhtar Belt, Iran

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Cenozoic magmatic assemblages are widespread in Iran, represented by the Urumieh-Dokhtar belt, East Iran belt, and Alborz-Azerbaijan belt. The magmatism was associated with a variety of ore deposits. Epithermal vein-type deposits are common, and some occur in close spatial association with porphyry Cu deposits (PCDs).

Chahmesi is a vein-type polymetalic (Cu-Pb-Zn-Au) deposit occurring about 3 km southwest of the Miduk PCD in the southern section of the Urumieh-Dokhtar belt, known as the Kerman copper belt. The deposit has been covered by IP-RS surveys, diamond drilling, and systematic assays for base and precious metals. Mineralization in Chahmesi consists of three steeply dipping, N-S– to NE-SW–trending veins and several smaller veins in Eocene mafic-intermediate lava flows and pyroclastic rocks. The veins consist of quartz and subordinate pyrite, chalcopyrite, galena, sphalerite, and barite, as well as trace bornite, arsenopyrite, tetrahedrite-tennantite, enargite, luzonite, and gold.

The veins display pinch and swell structures, and crustiform banding, symmetric banding, comb, vuggy, and hydrothermal breccia textures. Crosscutting relationships, mineralogy, and textures suggest three stages of ore formation. Gold occurs as native microscopic/submicroscopic particles in association with tetrahedrite-tennantite, arsenopyrite, chalcopyrite and, less commonly, other sulfides from stage I, the main stage. Sulfides are variably oxidized at surface and shallow depths, and a variety of secondary minerals are developed.

Three types of primary fluid inclusions were identified in quartz from the main stage: liquid > vapor (70–90% L), vapor > liquid (60–80% V), and rare single-phase liquid or vapor inclusions. T_H and salinities for the first two types vary between 175° and 350°C and 0.2 and 5.6 wt % NaCl equiv, respectively. No clathrates were observed in freezing runs.

The $\delta^{34}S$ values for 15 sulfide samples from various veins, determined at GG-Hatch laboratories, University of Ottawa, vary from –0.7 to –6.2‰, with galena and sphalerite plotting toward more negative values compared to pyrite and chalcopyrite. The calculated $\delta^{34}S$ values for H_2S fluid at average T_H values are –2.1 to –4.0‰. The narrow range of $\delta^{34}S$ values and the pattern of ^{34}S enrichment in sulfides are consistent with a common, relatively homogenized sulfur source. The isotopic values are comparable to those reported from the nearby Miduk PCD. $\delta^{18}O$ values for six vein quartz samples vary between 8.9 and 13.1‰ (av. 10.1%).

Silicic alteration is restricted to the immediate wall rocks and varies in thickness from <1 to 5 m. Argillic alteration, shown by bleaching of rocks, has variably affected all host rocks; it grades outward into widespread propylitic alteration dominated by calcite that appears to be a regional feature. Most ore occurs in quartz veins; unlike Cu, however, anomalous concentrations of Pb and Zn also occur in the altered wall rocks. Study of the nature of the argillic alteration and the link with the nearby Miduk PCD, as well as applications to PCD exploration, is in progress.