THE EPITHERMAL CHAH-MESI Cu-Pb-Zn-(Ag-Au) DEPOSIT, SE IRAN: ORE MINERALOGY AND FLUID INCLUSIONS

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In the southeastern part of the Cenozoic Urumieh-Dokhtar Magmatic Belt of Iran the NW-trending Kerman porphyry copper belt hosts major porphyry Cu-(Mo-Au) deposits (PCD) of Miocene age; e.g. the diorite-type Cu-Au Meiduk and granodiorite-type Cu-Mo Sar Cheshmeh deposits. The polymetallic vein type deposit Chah-Mesi is located ~1.5 km south of the Meiduk porphyry (Cu-Au) deposit. This study aims to clarify its genetic relation to the porphyry system. At Chah-Mesi, Paleocene to Eocene calc-alkaline volcanic and pyroclastic rocks of mainly basaltic-andesitic composition were intruded by Miocene microdioritic dykes. The host rocks were affected by intense hydrothermal alteration exhibiting a central zone of strong silicification that grades into sericitization and propylitic alteration towards the peripheral parts. Argillic alteration is restricted to superficial areas and in direction to the Meiduk PCD propylitic alteration changes into potassic alteration. Six different vein types are distinguished: including two porphyry-related vein types, three alteration-related types of veinlets as well as mineralized veins showing massive, banded, crustiform and brecciated textures. Mineralization occurs as open space fillings and minor replacement and breccia bodies. The paragenetic sequence encompasses four mineralization stages starting with the early high sulfidation assemblage pyrite + chalcopyrite + enargite + luzonite-famatinite ± bornite with a continuous transition into intermediate sulfidation state assemblages comprising pyrite + chalcopyrite + tennantite-tetrahedrite ± electrum ± Ag-bearing sulfosalts. The late paragenetic stage with sphalerite + galena + pyrite ± electrum overprints the earlier ones. Supergene mineralization with chalcocite + covellite + Fe-oxyhydroxides + Cu-hydrocarbonates is restricted to the shallow weathered part of the deposit. A regional zoning of ore minerals is apparent; central parts of the deposit are dominated by Cu-Fe-rich sulfides showing a transition to Pb-Zn-dominated zones mainly in the deeper and distal sections. Variations in the chemical composition of fahlores range from Fe-rich tennantite to Zn-rich tetrahedrite with a strong positive correlation between Sb and Ag contents. The fahlores are complexly zoned and display a progressive increase of Sb concentration with increasing distance to the nearby Meiduk deposit. Primary fluid inclusions in mineralized veins are low saline aqueous H_2O-salt inclusions. They yield homogenization temperatures ($T_{h\ LV\rightarrow L}$) between 115 to 295 °C for sphalerite and 145 to 397 °C for quartz. Salinity values range between 1.2 to 9.9 and 2.1 to 9.2 wt% NaCl equiv., respectively. Raman spectroscopy confirms low CO_2 concentrations of the vapor phase of the fluid inclusions. The fluids are interpreted to be of magmatic origin as indicated by stable isotope studies. We propose that ascending cooling magmatic fluids were responsible for the transport of metals and mineral precipitation occurred in the epithermal regime upon dilution of magmatic fluids with circulating meteoric water. Similar low-salinity, CO_2-bearing fluids were reported from the nearby Meiduk porphyry stock suggesting a genetic link between these two deposits.