

The study of mineralogy, geochemistry and fluid inclusions in quartz veins at the Mazreh Shadi gold deposit, northeastern Tabriz

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Abstract: The Mazra'eh Shadi is located about 130 km northeast of Tabriz (NW Iran) in the Arasbaran metallogenic belt. The deposit occurs as a series of veins within the Eocene andesites. Mineralization shows epithermal system that controlled by fault distribution. Epithermal textures within the veins include comb, vuggy quartz, cockade, boxwork, plate calcite and breccia. Pyrite is the main ore mineral associated with chalcopyrite, chalcocite, covellite, sphalerite, galena and gold. The result of geochemistry on the small rock samples from silica veins shows values of gold (max 17100 ppb), Pb (max 21100 ppm), Ag (max 9.43 ppm), Cu (max 611 ppm) and Zn (max 333 ppm). Microthermometric studies were conducted on quartz samples from silicified and mineralized zones and provides substantial micro-thermometric data for a new interpretation. Fluid inclusions generally occur in range from 5 to 90 μm in size. Three types of fluid inclusions are typically observed at Mazra'eh Shadi: (1) liquid-rich two-phase, (2) vapour-rich two-phase (3) vapour-rich mono-phase. The homogenization temperatures of all inclusions from 160 to 324 $^{\circ}\text{C}$ and the average of homogenization temperature is 228 $^{\circ}\text{C}$. The salinities are 0.17–5.1 wt.% NaCl equiv. The last ice-melting temperature is between -2.2 and -3.2 $^{\circ}\text{C}$. All fluid inclusions are plotted into the epithermal box and into the region between the primary magmatic water box and the meteoric water. Mineralization of Au is the result of pyrite precipitation, dilution- mixing of an oxidized meteoric water decreasing of pH, boiling and fluid mixing and there are two fluids participated in the formation of Mazra'eh Shadi deposit. Fluid inclusion data shows the depth of mineralization at Mazra'eh Shadi deposit probably ranged from 230 m to 380 m below the paleosurface and three-dimensional graphs confirm the deposition of lead and zinc in with high temperature-low salinity fluid and deposition of gold with low temperature-high salinity fluid. The zoning pattern shows clearly base metals such as Cu, Pb, Zn and Mo occur at the deepest levels, whereas precious metals occur at higher elevations with respect to base metals due to boiling of hydrothermal fluids in epithermal system.

Keywords: fluid inclusion; boiling; epithermal; Mazra'eh Shadi; Arasbaran.

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