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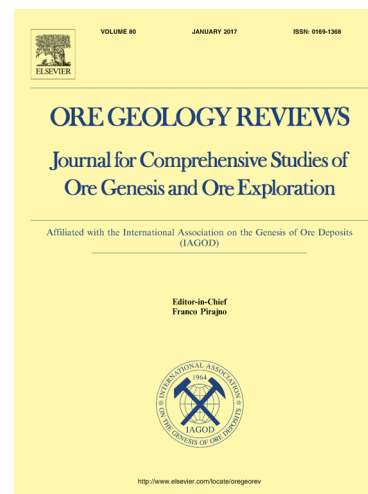
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ABSTRACT

Gold mineralization at Chah Zard, Iran, is mostly concentrated in breccia and veins, and is closely associated with pyrite. Optical and scanning electron microscopy-backscattered electron observations indicate four different pyrite types, each characterized by different textures: porous and fractured py1, simple-zoned, oscillatory-rimmed, framboidal and fibrous py2, colloform py3, and inclusion-rich py4. Laser ablation ICP–MS analysis and elemental mapping reveal the presence of invisible gold in all pyrite types. The highest concentrations (161–166 ppm Au) are found in py2 and py4, which correlate with the highest As concentrations (73,000–76,000 ppm). In As-poor grains, Au concentrations decrease by about two orders of magnitude. Copper, Pb, Zn, Te, Sb, and Ag occur with invisible gold, suggesting that at least part of the gold occurs in nanoparticles of sulfosalts of these metals and metalloids. Gold distribution patterns suggest that only negligible Au was originally trapped in py1 from the initial ore fluids. However, most, if not all, Au was transported and deposited during subsequent overprinting hydrothermal fluid flow in overgrowth rims around the margins of the py2 and within microfractures of py4 grains. Oscillatory zonation patterns for Co, Ni, Sb, Cu, Pb, and Ag in pyrite reflect fluctuations in the hydrothermal fluid chemistry. The LA-ICP–MS data reveal that Cu, Pb and Ag show systematic variations between different pyrite types. Thus, Cu/Pb and Pb/Ag ratios in pyrite may provide a potentially powerful exploration vector to epithermal gold mineralization at Chah Zard district and elsewhere.

Keywords: Epithermal gold; pyrite; texture; chemistry; Chah Zard; Iran.

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