

Hydrothermal evolution of Au-bearing pyrite veins and their association to base metal veins in the Central City district, CO, USA

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The Central City district has been interpreted as an alkaline molybdenum porphyry system in previous studies [1]. However, the presence of base metal veins and later sulfosalts suggests a more complex genesis of this deposit. The major goal of the study is to determine the physico-chemical conditions for hydrothermal Au transport and mineralization, and to establish the temporal evolution between Au and base metal mineralization stages. The mineralization of Au is constrained to quartz veins including quartz-pyrite and base metal veins hosted within a Precambrian gneiss. These veins occur in a concentric central and peripheral zone, which have been ascribed to a steep thermal gradient, with an intermediate zone host to both vein types [1, 2]. This research focuses on the quartz-pyrite veins and host rock and vein alteration by combining FE-SEM, automated mineralogy, thin section petrography and mineral geochemistry. Alteration includes overprinting of albitization by K-feldspar alteration, followed by phyllic and argillic alteration. Sulfides include early chalcopyrite, galena and sphalerite followed by chalcopyrite and sulfosalt (i.e. tennantite-tetrahedrite and enargite) replacement textures. The chemistry of pyrite and sulfosalts was determined using EMPA and LA-ICP-MS. Pyrite has been categorized into five different types based on geochemistry, microtextures and mineral associations. Pyrite surrounded by K-feldspar alteration have the highest Au concentrations (400-500ppm), whereas pyrite with base metals and sulfosalts have lower Au concentrations (200-300ppm). These pyrite generations and Au enrichment can be linked to different stages of alteration and mineralization.

[1] Rice *et al.* (1985), *Econ. Geol.* **80**, 1769-1796. [2] Sims *et al.* (1963), *USGS Prof. Paper* **359**, 1-241.