

Mineralogical and Geochemical Characteristics of the Epithermal Au–Ag Mineralization at the Felicia Orebody, Lepanto, Mankayan District, Philippines

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Recent exploration activities in the Mankayan District, Philippines delineated new sets of veins of the Felicia deposit. The veins exhibit brecciated and crustiform textures and are classified into four mineralization stages based on cross-cutting relationships.

Stage 1 veins consist of gray quartz and pyrite. Quartz occurs as elongated crystals, while pyrite is subhedral. Silver-bearing galena occurs as inclusions within pyrite. Stage 2 veins are characterized by abundant quartz, anhydrite, and sulfide minerals. Electrum occurs interlocking with sphalerite, pyrite, galena, and chalcopyrite. Petzite and Ag-bearing galena occur as inclusions in pyrite. Sphalerite, chalcopyrite, and galena commonly occur as fracture-fills and replacement of earlier pyrite. Stage 3 veins are dominated by rhodochrosite with very small amounts of sulfide. Stage 4 veins consist of coarse- to fine-grained anhydrite associated with electrum.

Bulk vein geochemical analysis shows that stage 1 veins contain up to 1.0 ppm Au and 17 ppm Ag. Higher gold contents were observed from the stage 2 and stage 4 samples, reaching up to 5.5 ppm and 6.2 ppm, respectively. Stage 2 veins contain a higher amount of Ag (194 ppm) than stage 4 veins (12 ppm). Electron probe microanalysis of sphalerite from stage 2 reveals FeS content ranging from 0.29 to 2.7 mol%. Sulfur isotope analysis shows that $\delta^{34}\text{S}$ values of pyrite and sphalerite from stage 2 veins range from 0.0 to +1.3 ‰ and -0.4 to +3.0 ‰, respectively. Anhydrite from the stage 2 veins has $\delta^{34}\text{S}$ values ranging from +15.7 to +25.4 ‰. Calculated sulfur isotope equilibrium temperatures from anhydrite and sphalerite pairs range from 300 to 450 °C. These results indicate that the gold and base metal sulfides of the Felicia veins were deposited from an intermediate sulfidation state fluid at relatively high temperatures.