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Constraints on Conditions of Mineralization in the Quartz-Hübnerite Breccia Pipe of the Western Dunmore Vein System, Silver Gulch, Colorado

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The Dunmore system contains mineralized breccia chimneys and veins in a zone that trends ∼3 kilometers east-west in Silver Gulch, Colorado. This system has been poorly studied but represents a well-exposed snapshot of mineral deposition analogous to Red Mountain breccia pipes and Silverton style veins. In this investigation, field and petrographic studies were combined with fluid inclusion analyses to unravel the fluid evolution, constrain temperatures, and estimate pressures of mineralization in the western Dunmore system. The results are novel and provide additional constraints of breccia chimney formation conditions in the region.

Field surveys were used to interpret textural and spatial relationships of the quartz-hübnerite zone and to collect samples for use in petrographic and fluid inclusions analyses. Petrographic analyses revealed the tungsten-breccia zone contains three dominant quartz generations: (1) Euhedral quartz with no growth zones (5 to 10 millimeters); (2) anhedral quartz with hübnerite and pyrite (1 to 2 millimeters); and (3) euhedral quartz with growth zoning (4 to 6 millimeters).

Fluid inclusions within the first quartz generation represent high temperatures (∼300^{0}C) but are highly deformed from rapid pressure and temperature fluctuations and system instability. No inclusions in the quartz-hübnerite generation are preserved, suggesting a transition from higher to lower temperatures. Late vuggy euhedral quartz with growth zoning hosts fluid inclusions with homogenization temperatures between ∼240^{0} and 250^{0} C. Pressure estimations based on topographic differences and paleosurface assumptions suggest system formation at ∼1,400-meter depths at ∼60 bars of pressure.

Surrounding breccia dikes and pipes represent a volatile-rich magmatic system with intense brecciation. The quartz-tungsten zone in the west Dunmore system shows minor brecciation, representing a later transitional stage from a mesothermal magmatic system into a cooling epithermal stage of mineralization.

Breccia pipes are commonly important mineralized components found with numerous types of economic mineral deposits. This study contributes to the developing genetic model of the Dunmore system along with other breccia pipe occurrences in the northern San Juan Mountains.
The Dunmore system illustrates a complex evolution of fluids and gases and the development of different but spatially related mineralized bodies in breccia systems.