

AN EVALUATION OF FLUID INCLUSION MICROTHERMOMETRIC DATA FOR ORPIMENT-REALGAR-CALCITE-BARITE-GOLD MINERALIZATION AT THE BETZE AND CARLIN MINES, NEVADA

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Abstract

Carlin-type deposits contain gold in association with main-stage quartz-pyrite-kaolinite mineralization and late-stage orpiment-realgar-calcite-barite mineralization. Fluid characteristics for main-stage mineralization are well documented by fluid inclusion and stable isotope studies on quartz. In contrast, fluid characteristics for late-stage mineralization are not well constrained because of large ranges in fluid inclusion microthermometric data. These ranges could represent real variations in fluids or be a result of the reequilibration of fluid inclusions.

Microthermometric analyses were conducted on fluid inclusions in samples of barite, calcite, realgar, and orpiment from the Betze and Carlin mines, Nevada. Petrographic studies of individual crystals and cleaved sections reveal that fluid inclusions in realgar and barite have negative crystal shapes, in contrast to elongate and rounded inclusions in orpiment and calcite. Point-count data document that one-phase liquid inclusions (type 1) are the dominant type in barite and realgar, relative to two-phase, vapor-poor inclusions (type 2) in calcite and orpiment. Type 2 inclusions in realgar and barite commonly reequilibrate (e.g., stretch) during analysis and exhibit ranges in homogenization temperatures (T_h) of 100° to 250°C and 110° to 300°C, respectively. In contrast, type 2 inclusions in orpiment and calcite have T_h of 108° to 182°C, which could be repeated to within 1°C. Based on these results, fluid inclusions in barite and realgar are most susceptible to reequilibration, with T_h of ~100° to 110°C most representative. Fluid salinities for orpiment and calcite are 1.7 to 5.4 wt percent NaCl equiv, relative to 1.1 to 2.9 wt percent NaCl equiv for barite and realgar. The lower T_h and salinity for fluid inclusions in barite and realgar suggest fluid cooling and dilution, following the deposition of paragenetically earlier orpiment and calcite.