Captured Halite Phenomenon in Fluid Inclusions -the Goat Hill Orebody, Questa Climax-type Porphyry Molybdenum System, New Mexico

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Fluid inclusions are a valuable tool for determining the genetic origin of ore deposits, yet data interpretation is not always straightforward, as shown by data from the Goat Hill orebody at the Molycorp, Inc., Questa Mine. Fluid inclusion data of the Goat Hill orebody is indicative of porphyry systems. Three main fluid inclusion types occur in the Goat Hill – vapor-rich inclusions with low-moderate salinity (I), liquid-rich inclusions with low-moderate salinity (II), and liquid-rich brine inclusions (III). The majority of the brine inclusions exhibit halite dissolution ($T_{shl}$) as the final homogenization phase change. There are several instances where the $T_{shl}$ occurs well above (over 50°C) that of vapor bubble disappearance ($T_{lv}$). As various pressure-temperature data indicate, the pressures corresponding to these types of fluids are much greater than any reasonable lithostatic load. This positions the Goat Hill orebody much too deep below the depth of emplacement. The origin of the type III inclusions that exhibit $T_{shl}>>T_{lv}$ in porphyry systems has been debated throughout the economic geology community. Two possibilities as to their origin have been suggested – overpressures, caused by system sealing is the most widely excepted mechanism, or captured halite crystals, a result of heterogeneous trapping. Overpressure is not indicated by the geologic context of the Goat Hill orebody. The low tensile strength of the propylitically altered andesite country rock at high temperatures would cause the andesite to fracture well before overpressures could occur. Captured halite crystals resulting from heterogeneous trapping of fluid inclusions is the accepted mechanism that produced the $T_{shl}>>T_{lv}$ inclusions in this study. Evidence of this phenomenon would be cogenetic vapor-rich and liquid-rich brine inclusions, variable liquid-vapor-halite phase ratios, solid inclusions of halite in the mineral sample, inclusions that contain more than one halite crystal, other daughter minerals that do not dissolve, and overestimated temperatures from the Na/K geothermometer, all of which occur in the Goat Hill orebody at Questa.