Vein Petrography and Geochemistry of the North Amethyst Au-Ag epithermal Deposit, Creede, Colorado USA

GUZMAN, MA[1] AND MONECKE, TM[1]

[1] Department of Geology and Geological Engineering, Colorado School of Mines, 1516 Illinois Street, CO 80401 (mguzman@mines.edu)

The Oligocene Creede mining district represents one of the most prolific intermediate sulfidation-state epithermal silver and base metal mining districts worldwide. The district is located in the Central San Juan Mountains of southwestern Colorado. The North Amethyst deposit consists of epithermal veins which filled dilatant zones of the Amethyst and Equity faults at or near the intersection of the two major structures.

The mineralogical and textural characteristics of the vein stages were determined by optical microscopy and back-scatter electron imaging on a scanning electron microscope. Electron microprobe analysis was performed on sulfide minerals to determine the geochemical characteristics of the vein stages. Particular emphasis was placed on the compositional analysis of sphalerite to constrain the temperature and sulfidation state of the hydrothermal liquids which formed the various ore bearing vein stages.

Four sulfide bearing vein stages were observed at the North Amethyst deposit and are each punctuated by a breccia or a gangue stage. The earliest of the four sulfide bearing veins is the Alpha stage which was observed from the deep to shallow elevations of the deposit. The hydrothermal liquids forming the Alpha stage are interpreted to have cooled as they ascended from deep to shallow levels of the deposit, acquiring a higher sulfidation state (1.3 to 0.24 mole % FeS). Following the Alpha stage, the precious metal (Au-Ag) bearing vein stage known as Beta stage was formed. The Beta stage is weakly mineralized at depth but is well developed in the shallow portions of the deposit. Beta stage veins are spatially associated with Alpha stage veins. Compositional variations in the sphalerite are less pronounced. However, the paragenesis of Beta stage indicates a shift from high to low sulfidation states through the transition from argentite-acanthite to native silver at the end of the mineral deposition sequence. The late base metal sulfide-rich Stage-1 was observed in the deep part of the deposit and the Fe-poor Base Metal Sulfide stage was observed at mid-elevation of the North Amethyst deposit. These two base metal and silver stages correlate with those recognized in the central and southern parts of the Creede mining district.