

STUDENT PRESENTATIONS

Jessica L. Smith, Daniel M. Sturmer (page 1) Lucia M. Patterson (page 2)

University of Nevada, Reno

New Models for Mineral Exploration in British Columbia: Is there a Continuum between Porphyry Molybdenum and Intrusion-Hosted Gold Deposits?

Jessica L. Smith and Greg B. Arehart
University of Nevada - Reno

The Adanac porphyry molybdenum deposit, located in northwest British Columbia, Canada, has experienced little academic research despite 40 years of exploration drilling. This study aims to classify Adanac within the spectrum of molybdenite deposits. Whole rock geochemistry studies of the host pluton indicate highly evolved, high-silica, alkalic granites, with low FeO contents and high K₂O values. The average Rb/Sr ratio is 7. Anomalous Mo, W, and F occur as stacked concentrations in cupolas over the porphyry intrusions. Alteration patterns include proximal silicification and potassic (K feldspar) alteration, intermediate and overlapping quartz-sericite-pyrite assemblages, and distal propylitic alteration characterized by chlorite. Re-Os dates from molybdenite indicate at least two episodes of mineralization at 70.9 to 69.7 Ma, and also confirm some of the lowest Re concentrations known in molybdenite samples. Seven phases of the host pluton were analyzed for U-Pb zircon age dates, with results suggesting magmatism occurred from 82.7 to 76.5 Ma. Adanac is best classified as a Climax-type, alkalic porphyry molybdenum deposit.

A secondary and more regional-scale goal of the study is to determine whether the same hydrothermal system that produced the molybdenite deposit may be responsible for gold-bearing quartz veins that occur within a kilometer of the deposit, and gold-bearing placers from two creeks that drain the area of the porphyry deposit. Historically, it has been assumed that gold in the area was derived from quartz-carbonate-bearing shear zones in Permian metasedimentary rocks and greenstones. A comparison of initial Os isotope ratios of placer gold and minerals from the molybdenite-bearing hydrothermal system is in progress. Similarities in these ratios may indicate a common origin.

Maximizing Carbon Sequestration and Minimizing Product Volume by Modeling Rock-CO₂(g) Reaction with Mafic Rocks from Nevada

Daniel M. Sturmer,
University of Nevada – Reno

Jonathan G. Price,
Nevada Bureau of Mines and Geology

and Regina N. Tempel
University of Nevada - Reno

Mineral carbonation is a process whereby carbon dioxide reacts with minerals or rocks to store the carbon permanently in synthetic minerals. The amount of carbon sequestered generally increases with Mg and Fe content in a rock, thereby focusing most mineral carbonation studies on ultramafic rocks. Ultramafic rocks are rare in Nevada, but mafic volcanic and plutonic rocks are abundant. Thus, the purpose of this study is to model the rock-CO₂(g) ex-situ reaction for Nevada mafic rocks at various temperatures using the EQ3/6 reaction path code. Preliminary work has tested the sensitivity of the carbonation reaction to changes in reaction temperature and the basalt geochemical composition.

This study used initial model conditions set by O'Connor et al. (2002) for wet mineral carbonation of forsterite. In each model a solution containing sodium, chloride, and bicarbonate ions was reacted with one kg of basalt and CO₂ (fugacity fixed at 150 bars) assuming arbitrary kinetics. Major and minor oxide geochemical data from the major basalt domains in Nevada were obtained from published literature. CIPW norms calculated from these data served as input basalt mineralogies. Models were run from 0 to 200°C at 25°C intervals for each basalt.

Mafic rock-CO₂ reactions maximized carbon sequestration at 25-50°C, but were fairly insensitive to temperature below 100°C. At these temperatures, most of the basalts captured 6-8 moles of carbon per kg of basalt reacted. However, low-temperature mafic rock-CO₂ reactions resulted in 3-5 times as much product volume as high-temperature reactions. In the models, carbon was sequestered in four phases: siderite, magnesite, dolomite, and dawsonite (below 150°C). Dawsonite has a much larger molar volume than other product minerals, resulting in the increased product volume with lower reaction temperature. At temperatures ≥150°C albite precipitated instead of dawsonite and the carbon that would have gone into dawsonite remains CO₂.

**Hydrothermal Footprints of Carlin-type Gold Deposits at the District Scale:
Jerritt Canyon Mining District, Elko County, Nevada**

**Lucia M. Patterson
The Ralph J. Roberts Center for Research in Economic Geology,
University of Nevada – Reno**

The Jerritt Canyon district, located in northeastern Nevada, hosts several Carlin-type deposits and has produced over 7 million ounces of gold to date. In 2000, Anglo Gold collected a data set consisting of multi-element analyses from 6,416 drill holes, from one stratigraphic interval at the bottom 5 feet of the Roberts Mountains Formation, directly above the Saval Discontinuity in the Jerritt Canyon district. This data set eliminates the effect that different lithologies may have on a hydrothermal footprint. Yukon-Nevada Gold also supplied their data set, which consists of previously logged geology from the Anglo Gold data set. A sub-set of holes were re-logged to document and obtain data on the Saval discontinuity, and to generate maps depicting patterns of alteration, veining, mineralization, carbonate isotopes, and clay distribution with respect to known mineralization. The geochemical data set was analyzed visually and statistically to document associations between gold and other elements. This presentation will detail some of the results of these analyses.