Discriminating multiple mineralization events of the diatreme-associated Cu-Mo-W-Au occurrences at the Revenue Deposit, Dawson Range, Yukon Territory

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The west-central area of the Tintina Gold Belt, Yukon Territory, Canada, is a perspective area for gold as it hosts large, high-grade deposits such as the Coffee Creek and Casino deposits. The Freegold Mountain Project located in the Dawson Range of the Tintina Gold Belt hosts multiple gold showings, including the Revenue Deposit: a poorly characterized diatreme-associated Cu-Mo-W-Au occurrence. This thesis project will characterize alteration and ore mineral assemblages at Revenue, and investigate the composition (major, minor, and trace element), and sulphur isotope signatures of ore minerals in order to discriminate different mineralizing events, fingerprint their chemical signatures, and elucidate the processes that led to their formation. Recent field work and sampling of exploratory drill-core confirmed at least two distinct styles of mineralization: early, vein-hosted and disseminated chalcopyrite-pyrite-pyrrhotite associated with potassic alteration in the Revenue Granite, and later breccia-hosted molybdenite-scheelite-pyrite-chalcopyrite with phyllic alteration likely associated with the emplacement of the pyroclastic diatreme and quartz-feldspar-porphyry dykes. Detailed petrographic work using optical microscopy and scanning electron microscopy, in conjunction with shortwave infrared spectroscopy (Terraspec), will (1) identify and characterize ore minerals and associated alteration, (2) examine microscopic textures, and (3) quantify the major and minor element composition of the mineral phases. By characterizing the mineral assemblages, we aim to classify the mineralization styles using existing models to be applicable in an exploratory setting. In situ laser ablation inductively-coupled plasma mass spectrometry will be used to determine the trace element compositions of ore minerals, in order to identify unique chemical signatures. Using secondary-ion-mass-spectrometry the sulphur isotope composition of sulphides from different assemblages will be determined. Together with trace element data, this information will provide constraints on the source of sulphur (i.e., mantle or sedimentary derived) and allow for the discrimination of different mineralizing fluids. The results of this study will be used to assign the different mineralization styles at Revenue to existing ore deposit models to benefit exploration programs (e.g., intrusion-related, skarn) in the region. [Poster}

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