Petrogenetic controls on gold mineralization within the Amber Zone at Cantung W mine, Northwest Territories, Canada

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The Cantung W-Cu-Au skarn is located within the Canadian Cordillera in the Northwest Territories approximately 400 km northeast of Whitehorse, Yukon Territory. It is related to an intrusive system that is part of Middle Cretaceous felsic plutonic suites that were emplaced into Neoproterozoic rifted margin and Paleozoic passive margin rocks bordering Laurentia. The deposit consists of a contact metasomatic hydrothermal system associated with a peraluminous biotite monzogranite that intruded into Lower Cambrian marble sequences, producing a zoned array of anhydrous and hydrous reduced skarns. There are several orebodies in the deposit, including the E-zone, the Pit, and the Amber Zone. The spatial and temporal relationship between the different zones is unclear.

Previous studies which investigated the gold mineralization in the E-Zone found no native gold or electrum. Spearman's Rank correlation coefficients (r') were calculated using whole-rock lithogeochemistry of samples from the E-Zone ore body (n = 48); a strong correlation between Au and Bi (0.76), Ag (0.70), Fe (0.64), and Cu (0.64) was identified. LA ICP-MS analyses of native Bi showed it did not contain anomalous gold concentrations. Bi- and Agtellurides and sulfosalts were found to be associated with the native bismuth; LA ICP-MS raster analyses detected highly elevated gold concentrations (800–1000 ppm) at the boundaries between alloy and sulfosalt minerals, which corresponded with high Ag peaks. The correlation between gold and bismuth suggests that low temperature bismuth melts played some role in the enrichment of gold in this system.

Samples taken from the Amber Zone also contained elevated gold concentrations (1 sample >10 g/t and 7 samples > 1g/t). Petrography of polished thin sections from these samples was conducted to characterize the ore and gangue minerals from these high grade samples and mineral paragenesis determined. No native gold or electrum was observed in these samples either. The textures exhibited by native bismuth in these samples suggest they formed as lowtemperature melts. These low-temperature melts mainly formed native bismuth; however Bi-Te-Se, and As-bearing phases also exsolved from these melts. Characterization of these Bi-bearing phases was conducted using SEM-BSE imaging and SEM-EDS analyses. The FEG-SEM was used to obtain more quantitative analyses on the small (<2–3 µm) Bi-Te-Se- and As-bearing phases. The objective is to use in situ LA ICP-MS analyses to determine the phases that host gold in the Amber Zone. Understanding the elemental associations at the mineralogical level will ideally provide vectors towards higher gold grades within this complexly zoned polymetallic skarn system.

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