

Alteration Mineralogy and Geochemistry at the Surebet Intrusion-Related Au-Ag Deposit, British Columbia, Canada

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The Surebet intrusion-related Au-Ag deposit is located ~40 km south of Stewart, British Columbia within 10s of kilometers from the intrusion-related Dolly Varden Ag deposit and the copper-rich Anyox VMS deposit. The deposit comprises mineralized quartz–sulfide veins that are hosted by Jurassic-Cretaceous volcanic and sedimentary successions of the Stikine terrane. The veins crosscut granodiorite dikes that are Eocene in age. While the relative timing and ore paragenesis are well constrained, the alteration signatures of the high-grade veins remain poorly defined. This study employs geochemistry data and short-wave infrared analysis on representative drill core samples to constrain the alteration mineralogy and geochemistry. The geochemical data indicates that high gold grades (>1 ppm) correlate with elevated As, Bi, Pb, Te, W, and Zn concentrations. The hyperspectral analysis shows that alteration mineralogy changes systematically with distance to the veins. Distal to the veins, sandstone contains muscovite and biotite while, proximal to the veins, a higher proportion of epidote, chlorite, amphibole, and lesser carbonate occur. In contrast, a high proportion of epidote, chlorite, biotite, and carbonate is observed in andesite units distal to the veins, with proximal zones containing a higher proportion of muscovite. In mineralized granodiorite dikes, abundant biotite occurs in vein selvages. Taken together, these observations suggest that calc-silicate (amphibole ± epidote) and potassic (muscovite ± biotite) alteration mineral associations, along with enrichments in Bi, Te, and W, represent key vectors to mineralization. The observed alteration trends are consistent with the model of intrusion-related Au-Ag deposits, especially the presence of high-temperature alteration mineral associations. The research highlights that the alteration mineralogy is controlled by host rock composition and changes with proximity to mineralization. Ongoing work will integrate thin-section-scale textural and mineralogical observations to define paragenetic relationships.