

SEG 2026 Conference in Salt Lake City, United States

High-grade Gold Controls and Spatial Chemical Zonation at the Snip North Prospect of the Iskut Project

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The Snip North prospect, within the Iskut project in northwestern British Columbia, hosts high-grade Au-Cu mineralization in multiple vein generations that cut volcano-sedimentary rocks and intrusive bodies. This study integrates core observations, petrography, SEM, micro-XRF, electron microprobe data from hydrothermal micas, fluid inclusions, and drillhole geochemistry to define the controls on high-grade gold and the spatial evolution of alteration and metal distribution.

SEM shows that gold occurs as Au-Ag electrum within or along chalcopyrite-pyrite grain boundaries. The highest Au grades are linked to Stage II-III quartz-carbonate-sulfide veins containing chalcopyrite, pyrite, sphalerite, and galena. These veins are associated with white mica halos in the shallower western part of the system, and with secondary biotite halos below about 400 m depth. Long-section and geochemical patterns show that Au is concentrated mainly in the shallow and western parts of Snip North, Cu is more broadly distributed through the system, and Mo increases downward toward quartz-monzodiorite intrusions, where it is comparatively decoupled from the main Au-bearing assemblage.

Mica chemistry records both fluid evolution and host-rock control. Mg-rich biotite reflects mafic wall-rock influence, whereas higher Al values mark white mica overprinting of earlier potassic alteration. Fluid-inclusion data indicate a moderately saline fluid that underwent pressure-driven unmixing and cooling, providing a plausible mechanism for rapid sulfide and electrum precipitation. Together, these results define a vertically zoned hydrothermal system and show that high-grade gold formed during a later overprint on earlier potassic-magnetite alteration, improving vectoring criteria for high-grade zones at Snip North.