Structural and Hydrothermal Controls on Mineralization of the Bronson Slope Porphyry Cu-Au-Mo Deposit, British Columbia: Implications for Exploration Targeting.

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Bronson Slope is a Cu-Au-Mo porphyry deposit located in the Stikine Terrane of the Golden Triangle District, northwestern British Columbia. This district hosts world-class porphyry and epithermal deposits, including KSM, Brucejack, and Red Chris. The deposit has an inferred resource of 517.3 Mt grading 0.33 g/t Au and 0.09% Cu. Mineralization is hosted within multiphase monzonite and quartz monzonite porphyritic intrusions emplaced into volcano-sedimentary rocks of the Triassic Stuhini Group. The mineralized body trends NW-SE, dips 60°–70° SW, and extends ~1 km in length, 0.5 km in width, and over 900 m in depth.
This study integrates lithological, structural, spectral, and ICP-MS geochemical data from 27 drill holes (25,246 m), complemented by geochronology, remote sensing, airborne magnetics, and magnetotellurics. A 3D model developed in Leapfrog Geo defines the deposit's geometry, stratigraphy, ore distribution, and geophysical features.

Hypogene alteration, veining, and mineralization exhibit a well-developed zoning with a central Cu-Au-rich core, surrounded by a Mo envelope and an outer Zn-Pb shell, crosscut by a NW-SE gold anomaly. Two distinct prograde hypogene alteration phases are identified: (1) pervasive biotite alteration in diorite and metasediments with biotite veining swarms and (2) magnetite-biotite alteration in early monzonite, characterized by intense quartz–magnetite stockwork veining. Intermineral monzonite is moderately altered by biotite–magnetite and cut by sheeted quartz–magnetite ± molybdenite veins. Late andesite dikes, weakly pervasively altered to chlorite, crosscut lithological units. Biotite alteration is overprinted by green mica-chlorite in the core and white mica-chlorite alteration at peripheries, which are structurally controlled along NW-SE structures.

Economic mineralization occurs as chalcopyrite-pyrite-gold and pyrite-chalcopyrite-gold quartz-carbonate veins. A weakly developed ~250 m thick supergene profile is dominated by goethite and minor chalcocite along fractures. High magnetic responses correspond to barren quartz–magnetite veins, while low magnetic and resistive signatures are linked to chalcopyrite–pyrite veining, indicating overprinting by a younger mineralizing event.