
The Skarn to Porphyry Transition: Establishing Geochronological and Geochemical Links Between Skarn and Porphyry-Like Mineralization at Craigmont, British Columbia

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The Craigmont Cu-Fe skarn deposit is located in the Quesnel terrane of the Canadian Cordillera in southern British Columbia. Craigmont was originally mined from 1958-1982, when it produced 36.75 Mt of ore averaging 1.28% Cu, and is one of the highest-grade copper mines in British Columbia to date. Craigmont is adjacent to the Late Triassic Guichon Creek Batholith, which hosts calc-alkalic Cu-Mo porphyry deposits of the Highland Valley District. The Cu-Fe skarn mineralization is restricted to Upper Triassic Nicola Group volcaniclastic rocks and marine sedimentary rocks in actinolite-epidote-magnetite-chalcopyrite skarn and brecciated specular hematite-chalcopyrite±K-feldspar. Early academic work suggested the Guichon Creek Batholith only acted as a heat source to skarn mineralization from fluid infiltration into Fe-rich Nicola Group host rocks. Recent drilling, however, has confirmed porphyry-style alteration assemblages in the Guichon Creek Border Phase (diorite to quartz-diorite) immediately north of the historic Craigmont open pit mine. This study aims to identify the link between the skarn and porphyry-style mineralization at Craigmont and characterize porphyry-style mineralization and alteration in order to develop vectors for porphyry Cu exploration. Field and microXRF petrographic studies on selected Border Phase intrusive rocks show K-feldspar-biotite, epidote-chlorite, and sericite-quartz±chlorite alteration. Vein types include K-feldspar-chalcopyrite-pyrite-(±molybdenite), locally with bornite, epidote-chlorite, and quartz. Chalcopyrite, bornite, and molybdenite are typically associated with K-feldspar-biotite alteration. Field mapping, core logging, and deployment of modern analytical techniques, such as microXRF analysis, Re-Os molybdenite dating, short-wave infrared (SWIR) spectroscopy, U-Pb zircon dating, and whole-rock lithogeochemistry will be applied to characterize both skarn and porphyry type mineralization and establish spatial and temporal links between two different mineralizing systems. Results are expected to define mineralization and alteration footprints and help exploration targeting in the porphyry belts of southern British Columbia and similar orogenic belts globally.