Correlating PGE enrichment with alteration assemblages at the Afton-Ajax Cu-Au-Pd porphyry system, Kamloops, British Columbia

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The Afton-Ajax alkalinic copper-gold porphyry deposit is located just outside Kamloops in the southern Cordillera of British Columbia, and has been noted to contain up to 3 ppm of palladium in multiple ore zones. The platinum group elements (PGE) occur in (i) platinum group minerals (PGM), specifically Hg-Te-As-Sb-Pd phases, commonly associated with chalcopyrite, pyrite, bornite, electrum, and hematite, and in (ii) pyrite (as dissolved constituent with Co and Ni). Cu and Au grades rarely correlate with PGE abundances and, therefore, the timing and conditions of Cu and Au precipitation are different from those of PGE. The exact modes of occurrence and alteration assemblage associated with the PGE-enriched zones are unknown. Variations in alteration assemblages may be useful to differentiate between PGE-rich and PGE-poor zones. Petrographic analysis and infrared spectroscopy will be used to determine the alteration assemblages within the suite of 44 samples. An attempt to correlate these specific alteration assemblages with enrichment in PGE will be made.

Alteration styles determined through the use of transmitted light microscopy include silicification and argillic, potassic, phyllic, and propylitic alteration. Silicification occurs as a pervasive front in high sulfidation and vein-rich samples, typically associated with phyllic or argillic alteration. Argillic alteration is characterized by a matrix of indistinguishable clay minerals. Two forms of potassic alteration were found: (1) large biotite in places replaced by chlorite in hornfels; (2) fine-grained biotite localized around veins and blebs of sulfide minerals. Phyllic alteration is pervasive and characterized by sericite and clays. Propylitic alteration is locally pervasive around quartz/carbonate veins, blebs or infilling fractures, and is identified by the presence of chlorite, actinolite, and/or epidote.

The Terraspec4 Hi-res mineral spectrometer (ASD Inc) will be used to conduct infrared spectroscopy with the aim of identifying the alteration minerals, specifically clays and other phyllosilicates. The data collected from infrared spectroscopy will also be used to determine compositional variations in clay minerals that may correlate with an increased abundance in PGE/PGM. This process, if applied in a field or lab setting, has the potential to assist in determining in which stages of alteration PGE were deposited. Alteration-PGE criteria may assist in creating exploration guidelines for the occurrence of PGE in other similar porphyry deposits in the Canadian Cordillera.

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