Metallogenesis of the Boyvinet Stock, Desmaraisville, Québec

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Abstract

This MSc project aims to characterize a genetic model for the cryptic and disseminated gold-copper mineralization hosted in a plutonic stock. The exploration project (Lac Shortt: SOQUEM Inc. & MDN) is located within the Abitibi Greenstone Belt, Québec. The property was previously drilled and trenched, but the gold-copper mineralization still remains misunderstood. Average grades in drill cores are commonly > 1 ppm Au along metric scale zones and some trenches yields above 3 ppm Au. The intrusion is mainly composed of ±40% albite, ±10% quartz, plagioclase, epidote, chlorite and ±5% magnetite, pyrite, hematite, K-feldspar and titanite, typical with an interpreted syenitic composition. However, geochemical characterizations indicated that the intrusion is rather calc-alkaline (La/Yb = 22) with a classical arc signature (Nb & Ta negative anomaly). Furthermore, basaltic rocks around the intrusion share the same geochemical characteristics, hence supporting a cogenetic link and consequently a syn-volcanic origin rather than a late-tectonic alkaline stock. This revised origin has a profound impact on ore genesis that was previously interpreted as magmatic-related, as it is the case for other gold deposits in the district (Lac Shortt and Batchelor). Albite is thus related to a widespread hydrothermal event having also induced mineralization.
Hydrothermal alteration associated with gold-copper mineralization, although weakly developed, occurs as a carbonate-quartz-albite-pyrite-chalcopyrite and magnetite mineral assemblage. Fluid inclusions in quartz veins were analyzed by solid-probe mass spectrometry. Preliminary results revealed CO_2-rich and H_2O-poor fluids, with traces of CH_4 and N_2, more compatible with an orogenic origin. The presence of magnetite, as a magmatic or hydrothermal-related product, could be a key for precipitating gold by changing the oxygen fugacity of the fluids. In the affirmative, the use of aeromagnetic surveys could lead to indirect mapping of magnetite-rich zones in the intrusive rock, with the potential of being gold-enriched by later orogenic fluids.