

2007-10: Alteration minerals used as exploration guides

This project on alteration minerals was carried out in two phases: 1) an approach that aimed to test a new working hypothesis for postmetamorphic alteration associated with alkaline intrusions and 2) a methodological study on the various portable analytical instruments. The portable instruments chosen for the test were an ASD infrared spectrometer (GSC, Ottawa) and an X-ray fluorescence spectrometer (GSC, Quebec). The Bouchard-Hébert mine, the Cléricy syenite and the Douay deposit were sampled to test the usefulness of the portable equipment for VMS, and for sterile and gold-bearing alkaline intrusions. Representative samples were selected from several types of sterile and fertile alterations.

Mineralogical (whole rock XRD and <2µm clay fraction) and morphological analyses (SEM) of the samples documented mineral assemblages in altered zones deemed to be fertile. The fertile assemblages differ mineralogically and morphologically from the assemblages considered to be sterile, which consist of metamorphic and intrusive rocks that host the studied mineralisation. The assemblages considered to be fertile consist mostly of ankerite, dolomite, rhodochrosite, albite, illite and iron-chlorite. They indicate higher emplacement temperatures (~ 350-300 °C) at Bouchard-Hébert compared to Douay (~ 250-150 °C). At Douay, a retrograde alteration assemblage (~ 150 °C) consisting of calcite – interlayered illite-smectite is associated with gold remobilisation. A preliminary interpretation indicates that this assemblage is limited to areas with very high gold values.

Tests carried out on the same samples using an ASD infrared spectrometer have shown that the instrument identified the documented retrograde fertile assemblages easily. Analytical resolution of the illite, chlorite and ankerite signatures is sufficient to develop several types of signal processing useful for 3D mapping of these fertile retrograde assemblages.

Project 2007-10: Summary	
Objectives	<ul style="list-style-type: none"> • To test alteration mineral compositions by identifying the contexts where these minerals are associated with gold and base metal mineralisations, as well as in sterile environments. • To develop an exploration tool for assessing alteration fertility.
Results	<ul style="list-style-type: none"> • Documentation of fertile alteration assemblages consisting of carbonates, albite, K-feldspar and clay minerals (illite, interlayered illite-smectite, smectite). • The presence of retrograde clays in the fertile alteration assemblages makes them easily detectible using a portable infrared spectrometer.
Innovations	<ul style="list-style-type: none"> • The characterisation of clays is an effective tool for identifying fertile retrograde assemblages in the metamorphic rocks of the Abitibi. • Illustrates the existence of retrograde alterations associated with alkaline intrusions in the Abitibi. • Paves the way for several applications, including principal component analysis of carbonates.
Special Collaboration	<ul style="list-style-type: none"> • Benoît Dubé, Patrick Mercier-Langevin & Jeanne B. Percival (Geological Survey of Canada).