Lypaczewski P, Gaillard N, Perrouty S, Rivard B, Linnen RL, 2017, Hyperspectral characterization of white mica and biotite mineral chemistry across the Canadian Malartic gold deposit, Quebec, Canada, Abstract, GAC-MAC, Kingston, ON

The Canadian Malartic gold deposit is located in the highly gold endowed Abitibi region of Québec. A large part of the mineralization is located within Archean metasedimentary rocks, which are often challenging to characterize by conventional core logging. We make use of a hyperspectral imaging system (Specim SisuROCK™) to acquire shortwave infrared spectra (SWIR, 1000-2500 nm) at high spatial resolution (0.2 - 1.0 mm/pixel) over several hundred meters of drill core from the ore zone, as well as on distal, unaltered samples. In SWIR spectra, characteristic cation-OH absorptions can be used to identify mineralogy and to estimate mineral chemistry of white mica, biotite and chlorite. The high-resolution spectral imagery allowed us to identify a correlation between mineral chemistry and downhole Au grades. Mineralized intervals are characterized by the presence of phengitic white mica (>2206nm, <3.3 Al^{VI} apfu for 22O) and Mg-rich biotite/chlorite (Mg# > 70), and present texturally complex changes in mineral abundance and chemistry. In unaltered samples, white mica bearing beds show more muscovitic compositions (<2202nm, >3.5Al^{VI} apfu), and are in sharp contacts to white-mica free greywacke beds. Biotite/chlorite are of intermediate composition (Mg# 50-60) and show no textural variability within a given sample. The SWIR analysis also included over 800 point measurements, collected with a portable field spectrometer (Terraspec®), from outcrops in an 8 x 12 km² region surrounding the deposit. These data revealed a multi-km hydrothermal alteration halo surrounding the deposit. Additional reflectance spectra were acquired from drill core using a thermal infrared system (TIR, 8000-12000 nm). The TIR spectra are responsive to Si-O bonds, therefore allowing us to estimate and map the relative downhole abundance of quartz. Estimated relative quartz abundance is well correlated to the degree of silicification estimated from conventional core logging. Because data acquisition is rapid (1 minute per core box), spectrally detectable changes in mineral chemistry make hyperspectral imaging a useful tool for delineating mineralized intervals in drill core, as well as for estimating silicification. Portable infrared spectrometers allow for rapid characterization of mineral chemistry directly on outcrop, and have potential for vectoring towards mineralization in similar geologic environments.

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