Raman spectroscopy and Laser Ablation ICP MS of hematite and martite from uraniferous greisen veins, Mt. Douglas Granite, NB Canada

NADIA MOHAMMADI[1], CHRISTOPHER R.M. MCFARLANE[2], DAVID R. LENTZ[3]

[1, 2, 3]Department of Earth Science, University of New Brunswick, Fredericton, NB, E3B 5A3, Canada

[1]nadia.mohammadi@unb.ca, [2]crmm@unb.ca, [3]dlentz@unb.ca

Hydrothermal hematite and martite occur in earthy-red greisen and sheeted veins of the Late Devonian (~370 Ma) Mount Douglas Granite, eastern part of the Saint George Batholith in southwestern New Brunswick, Canada. These oxides are part of a complex hydrothermal paragenesis that includes pyrite, arsenopyrite, sphalerite, wolframite, bastnaesite, Th-silicates and rare uraninite. Hematite also locally co-precipitated in clots with hydrothermal monazite, xenotime, and zircon. Thus, these veins provide an ideal setting to test the potential applicability of hematite U-Th-Pb geochronometers in hydrothermal settings. Documenting the actinide content and microstructure of hematite-martite is a first step in this study. A Raman-spectroscopy survey revealed the presence of martite (pseudomorphed magnetite) as well as hematite, with both minerals showing systematic variations in FWHM of characteristic peaks, manifest predominantly by a feature at ~600 cm^{-1}. This broadening was most obvious in Fe-oxide grains adjacent to monazite and zircon, but isolated grains also exhibited variations in peak width. Preliminary LA ICP-MS on various habits of hematite reveals a range of 3 to 41 ppm U and 1 to 6 ppm Th (standardized using NIST610). Anomalous concentrations of Sn (average of 1628 ppm) and W (average of 494 ppm) were also observed and low %RSD ablation signals attest to mostly lattice-bound incorporation of trace metals rather than micro-inclusions. Existing literature predicts uranium incorporation into the hematite lattice as U^{6+} into a distorted, octahedrally coordinated site replacing Fe^{3+}. Calculated radiation doses range from 2.8E13 to 3.6E14 α-events/g. Thus it appears that a systematic assessment of microstructure evolution in hematite-martite can be extracted. In addition, because the age of these griesen veins can be independently measured using in-situ monazite, xenotime, and zircon U-Th-Pb geochronology, this setting will provide a well-constrained assessment of oxide geochronology and trace element signatures in hydrothermal ore systems.