MLA-SEM Mapping of Uraninite and Other Phases in Polished Thin Sections from Deposits in the Labrador Central Mineral Belt

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To determine the nature and mineralogy of uranium-bearing phases, and other associated minerals, in deposits from the Aurora Energy Resources Corp. Labrador Central Mineral Belt Project (LCMB), a number of polished thin sections were mapped using the MLA-SEM facility at the Inco Innovation Centre Memorial University. This facility consists of a ***FEI Quanta 400*** environmental Scanning Electron Microscope (SEM) equipped with Mineral Liberation Analyser (MLA) software developed at the University of Queensland (Australia) Julius Kruttschnitt Mineral Research Centre (JKTech). The SEM uses an Energy Dispersive X-ray (EDX) analyser configured in Back Scatter Electron image mode (BSE). Essentially the MLA distinguishes mineral grains in a polished thin section based on variations in elemental density and the SEM analyses each identified grain that is $\leq$ 3 -5 microns in diameter. The analytical parameters can be set such that only minerals with a given element density or greater will be analysed. Hence, the MLA allows for the quantitative mapping of mineral phases in an individual polished thin section; essentially providing a digital point count of mineral phases.

The MLA compares the analytical spectra for any phase analysed with a "library" of mineral spectra to identify the particular phase. If it can't identify the mineral, the MLA records it as "unknown" and the analyst manually examines the derived spectra and identifies the mineral. The MLA assigns a false colour to each example of a particular mineral phase which can be built up to produce a mineral map of a polished thin section. The MLA maps each sample in terms of frames per sample; each frame representing a portion of the sample. The grains in each frame are analysed and then their relative and absolute abundances are calculated. When all the frames within a sample are "stitched" together, a BSE map of the entire section can be created. The MLA software can also produce maps with the false-coloured images of each mineral phase identified. These images can be viewed as single grains, as tables of all grains for a particular phase, or as part of the "frame" in which that particular grain was identified. The latter image provides context for the grain in question in relation to its texture and inter-relationships with other phases. The original SEM-BSE image for a given frame can also be recalled to directly compare with the derived false-colour image.

Preliminary work on the LCMB samples indicated that the dominant uranium phases were varieties of uraninite with differing siderophile (*e.g.,* Si, Fe, Ca, Ti, *etc.*) element contents. Zircon was intimately intergrown with the U-phases. Samples from the Michelin deposit contained the most extensively developed zircon, more REE-bearing minerals, and more allanite than others samples. Also barite and titanite are important in the Michelin samples, and apatite, garnet and galena are significant in the Michelin samples. Sphalerite was found to only be common in the samples from the White Bear Prospect samples.