

Identification and Speciation of As-bearing Solids in Mine Tailings Using microXANES

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Beamline(s): **X26A**

Introduction: The objective of this research is to characterize As-bearing solids present in tailings from the Giant Mine, Yellowknife, Canada, and identify weathering reactions that may lead to attenuation or release of As to the environment. MicroXANES provides the opportunity of identifying the oxidation state of As and thus distinguishing As-bearing sulfides, iron oxides, etc. even in very fine-grained material.

Methods and Materials: We collected 54 spectra from 9 thin sections of mine tailings and 26 spectra from three thin sections of mill products. The latter were investigated in order to determine the forms in which As is introduced to the tailings so that the effects of weathering reactions can be distinguished.

Results: Oxidation states of the As in the analysed spots could be interpreted unambiguously. Peak shifts were comparable to those measured on standards. Results for the mill waste products indicate that fresh floatation tailings contain only sulfide-bound As while the mill roaster products contain As in all three oxidation states. Many of the microXANES spectra collected on unknowns show clear evidence of mixed As species, defined by both shift in XANES edge position and double peaks in the spectra. We interpret most of these of represent a mixture of two As-bearing solid phases.

Conclusions: Results to date indicate that microXANES may provide a powerful fingerprinting technique that identifies As-bearing solid species. These data can then be used to evaluate the risk to human and ecosystem health from mine waste and contaminated soil.

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