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Canadian Light Source / Centre canadien de rayonnement synchrotron

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Cameco: *Collaborating for the World's Uranium Future*

Certain chemical elements in uranium mine tailings pose a potential risk to the environment, so much so that the Canadian Nuclear Safety Commission requires that potential impact be modeled for up to 10,000 years. In order to improve these estimates, Cameco and University of Saskatchewan researchers like Jim Hendry are, he says, "using almost all available analytical techniques to assess the fate and transport of potential contaminants from the tailings."

The demanding nature of this effort has led Cameco to join forces with the University of Saskatchewan and the CLS, bringing researchers and industry together to study the long-term fate of these mining by-products in the environment. "From the corporate side, this is a really good thing to do," says Tom Kotzer, Cameco's senior environmental geochemist. "We gain access to researchers and technologies that we wouldn't normally have on a daily basis."

Hendry, an NSERC Industrial Research Chair in Geological Sciences, leads the research to examine the behaviour of arsenic, radium, and other elements in the mine tailings and surrounding groundwater flow system. These elements and associated complexes may be solid or liquid. The NSERC-funded researchers want to see how long they will remain in their solid form once the toothpaste-like tailings have been deposited in the tailings facility. The challenge is predicting when the elements will, over the next 10,000 years, leach into the surrounding natural rock, and flow with groundwater to arrive in nearby lakes and streams.

Only the high-energy beamlines at synchrotrons such as the CLS have proven sensitive enough to characterize these elements present at small concentrations in a poorly crystalline matrix. When in solid form, arsenic and other elements are bound to other minerals, effectively tying them up in the tailings. "Understanding the binding is impossible without the synchrotron," says Hendry. "Before we used it, we could only postulate how the contaminants were associated with adjacent elements. Now we can begin to answer that question."

Given the immense time scale and possibility for unexpected change, the researchers' aim is to narrow the range of possibilities. "The goal is to reduce uncertainty," says Kotzer. "We can't always reasonably predict what will definitely happen 10,000 years from now, but we can use these data and concepts to improve our understanding, hypotheses and modeling results." Publishing this information will help, Hendry says. "It's the peer review process that ensures the integrity of the science."

What also helps solidify the science is the collaboration itself: the merging of Cameco's expertise in engineering, metallurgy, and geology with the University's knowledge in aqueous and environmental geochemistry, and the unique synchrotron analytical techniques available at CLS. The arrangement also provides data that would be otherwise unavailable to academics. "Being a university researcher working with industry on highly scientific, highly industrial research," says Hendry, "is highly rewarding."

Tom Kotzer, Cameco Senior Environmental Geochemist and Jim Hendry, Senior Cameco-NSERC Industrial Research Chair, Geological Sciences, University of Saskatchewan