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Advanced technologies for sustainable exploitation of uranium-bearing mineral resources in Finland

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Efficient metal recovery from complex polymetallic and low-grade large-tonnage mineral resources is a major challenge, both metallurgically and in ensuring compliance with environmental and social legislation and expectations. In recent years, several exploration and mining projects in Finland have focused on the exploitation of uranium-bearing polymetallic deposits, in which the primary targeted commodity includes gold, nickel, cobalt and other base metals, as well as rare earth elements. Mineral parageneses and the relationship between these metals and the deportment of uranium of ores must be carefully documented in order to develop an optimum flowsheet for processing. Our current research is aimed at combining this mineral characterization with the development and demonstration of new techniquess for the effective recovery of uranium from process and mine waters, even at low concentrations. These approaches cover the utilization of different bisphosphonate adsorbents, hybrid materials of nanoporous silicon carbide frameworks and BPs, and biological/bioelectrochemical uranium reduction.

We have selected several metallogenically diverse uranium-bearing deposits in Finland, representing sedimenatry hosted and metamorphosed, Au-Co-U deposits and intrusive-related REE mineralization. In addition to microscopic (MLA, EPMA, SEM, microCT) and isotopic (LA-ICPMS) mineralogical characterization we perform a range of laboratory-scale bulk leaching experiments at the GTK Mintec processing plant. Both process waters and minewaters collected from dormant open pits are being tested for selective recovery and isolation of not only uranium, but also other metals, with the aim of integrating these bisphosphonate and biosorption techniques into processing flowpaths, for metal recovery and environmental management. Bench-scale experiments have demonstrated the effectiveness of both the biosorption of activated sludge and bisphosphonates and hybrid derivative materials in adsorption of uranium from solution, even at very low concentrations, with the additional advantage of allowing rapid and efficient recycling and reuse of sorbent materials.

Country or International Organization

Finland

Primary author: Mr SORJONEN-WARD, Peter (Geological Survey of Finland)

Co-authors: LAKANIEMI, Aino-Maija (Tampere University of Technology); Mr TASKINEN, Antti (Geological Survey of Finland); Mr POHJOLAINEN, Esa (Geological Survey of Finland); Mr KANKKUNEN, Janne (Geological Survey of Finland); Prof. VEPSÄLÄINEN, Jouko (University of Eastern Finland); Mrs KAUPPILA, Päivi (Geological Survey of Finland); Mrs NEITOLA, Raisa (Geological Survey of Finland); PERÄNIEMI, Sirpa (Geological Survey of Finland); Mr NISSINEN, Tuoma (Geological Survey of Finland); Prof. LEHTO, Veli-Pekka (University of Eastern Finland)

Presenter: Mr SORJONEN-WARD, Peter (Geological Survey of Finland)

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