

Innovative Elution Processes for Recovering Uranium from Seawater

PI: Chien M. Wai, University of Idaho

Program: MS-FC

Collaborators: Dr. Guoxin Tian, Lawrence Berkeley National Laboratory, Christopher J. Janke, Oak Ridge

National Laboratory

ABSTRACT

Developing economically favorable and environmentally sustainable processes for extraction of uranium from seawater is very important for the future of nuclear energy. This inexhaustible source of uranium would eliminate problems associated with mining of uranium from terrestrial ores and uncertainty about future supplies of uranium ores. The proposed supercritical fluid elution technology could significantly improve the performance of the currently known sorbent systems for uranium extraction from seawater. The proposed research would also greatly increase our knowledge regarding complexation of uranyl with the amidoxime-based sorbents and their deterioration mechanisms after repeated use. Such knowledge could lead to designing of more efficient and durable sorbent systems for uranium recovery from seawater. The proposed research would also provide an excellent opportunity for educating graduate students and post-doctoral fellows in nuclear energy related research.

The first year of the project will start with testing sc-CO₂ elution of uranium sorbed on amidoxime-based sorbent systems using different extractants. The kinetics of the sc-CO₂ elution process will be measured using in situ spectroscopic method. The durability of the sorbent systems for repeated sorption-desorption of uranium will be studied in the second year. Spectroscopic investigation of uranyl coordination and mechanisms of deterioration of the sorbent systems will be studied in the third year. A comparison of the sc-CO₂ elution and the conventional acid leaching will also be conducted in the third year. Christopher Janke of Oak Ridge National and Dr. Guoxin Tian of Lawrence Berkeley National Lab who are currently synthesizing amidoxime-based sorbent systems will provide the sorbent materials for this study.