# TECHNOLOGY FOR RESTART OF NUCLEAR FUEL CHEMISTRY AT MU

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## ABSTRACT

Nuclear fuel reprocessing is a responsible choice for the continued expansion of a secure, safe and clean source of energy. While the classical method for recycling nuclear fuel is an aqueous liquid-liquid extraction, the use of a dry, non-aqueous electrochemical means of separating constituents is gaining attention.

In the 1990's, the University of Missouri (MU) performed molten chemical experiments on mixed lanthanide and actinide systems appropriate for the separation of species known to be encountered when nuclear fuel is recycled. This project was completed by 2000 and new equipment must be ready to restart this electrochemical research. This work describes the technology that is now available to continue this work.

Specifically, the containment required for keeping a clean environment for operations is described as well as a new reference electrode designed for molten salt electrochemistry that does not require Vycor or quartz in its construction and demonstrates good reliability.

Some electrochemical examinations were conducted on samples of green mill tailings from a hematite mine in southeastern Missouri. These tailings are rich in rare-earth elements (lanthanides) which are technologically important for electronics manufacture. Separation of these elements into pure metals can be accomplished with far fewer waste products using a dry molten salt.