

INTERNATIONAL NUCLEAR ENERGY RESEARCH INITIATIVE

Development of an Advanced Voloxidation Process for Treatment of Spent Fuel

PI (U.S.): Brian Westphal, Idaho National Laboratory (INL)

Project Number: 2007-002-K

PI (ROK): Jang Jin Park, Korea Atomic Energy Research Institute (KAERI)

Program Area: AFC R&D

Start Date: October 2007

Collaborators: None

End Date: September 2010

Project Abstract

This project will address the head-end treatment of spent nuclear fuel undergoing pyroprocessing. The objective is to develop an advanced voloxidation process that provides a means to recover fuel from the cladding, prepares fuel for subsequent processing, simplifies downstream processing by removing volatile fission products prior to the pyroprocess, and safely traps the volatile fission products. Advanced voloxidation will also address fuel types other than light water reactor fuels, such as fast reactor oxide fuels.

The basis of the voloxidation process is to oxidize spent oxide fuel at low temperatures (about 500°C) in order to remove tritium and increase the dissolution rate during aqueous processing. Advanced voloxidation not only performs these functions but also removes and collects specific fission products such as krypton, xenon, cesium, rubidium, iodine, technetium, molybdenum, and ruthenium.

This new advanced voloxidation project encompasses three primary tasks related to pyroprocessing: 1) evaluation of the effects on downstream processes including feed requirements, equipment durability, waste generation, process efficiency, facility layout, economics, and proliferation concerns; 2) optimization of the capabilities of the off-gas trapping system for fission products; and 3) development of specific operational parameters for advanced voloxidation, such as temperature, hold times, and mechanical agitation.