Used Fuel Disposition

Used Fuel Degradation & Radionuclide Mobilization Activities Overview

SAND2012-3890P

- **Collaborative Effort – ANL, PNNL, SNL**
- **Purpose**
  - Investigating the long-term behavior of used fuel as a waste form
    - *Developing a comprehensive understanding of the current technical bases for disposing of used fuel*
    - *Evaluating range of disposal environments*
    - *Identifying the opportunities for long-term research and development*
  - Integrate with Waste Form Campaign for other waste forms
- **Approach**
  - Process Modeling
    - *Implementation of Radiolysis Model (PNNL)*
    - *Implementation of the Mixed Potential Model (MPM) for Matrix degradation (ANL)*
    - *Molecular scale modeling of UO_2, alteration products, and surface reactions (SNL)*
    - *Molecular scale modeling of epsilon phase (noble metal particles) and surface reactions (PNNL)*
  - Experimental Studies
    - *Electrochemical cell studies to quantify the effects of noble metal particles (catalytic/cathodic) on matrix degradation (ANL)*
    - *Generation of radiolytic species and studies of used fuel degradation at future conditions (PNNL)*
  - Integration and UFD&RM Model Implementation into GPAM
    - *Constraints on the Fast/Instant Release fractions (SNL)*
    - *Integration of the process models into GPAM (SNL, ANL, PNNL)*
      - GPAM staff working up new platform for implementation

Used Fuel Degradation & Radionuclide Mobilization Activities Overview (cont'd)

- **Milestones**
  - M2FT-12SN0806062 -- "Integration of EBS Models with Generic Disposal System Models" (September 7, 2012)
    - *Draft report outline generated*
    - *Intended to be living document for EBS models and for FY12 will have*
      - Broad coverage of EBS models
      - Details of Used Fuel Degradation models for implementation into GPAM
  - Level 4 Testing Plan Milestones Delivered on schedule
    - *PNNL (M4FT-12PN0806052) December 2011*
    - *ANL (M4FT-12AN0806011) January 2012*
- **International Activity**
  - Associated Group Participation
    - *Participated in the Kickoff meeting for "Fast/Instant Release of Safety Relevant Radionuclides from Spent Nuclear Fuel (FIRST – nuclides)"*
      - *3-year EC Collaborative Project*
      - *Focusing on high burn-up fuels*
  - *Two Seminars presented on UFD&RM Activities*
    - *Karlsruhe, Germany (KIT-INE)*
    - *Barcelona, Spain (AMPHOS21)*