

# Aluminum Solubility and its Effect on Sodium Management

Prepared for the U.S. Department of Energy  
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy  
Office of River Protection under Contract DE-AC27-08RV14800



P.O. Box 850  
Richland, Washington 99352

**Approved for Public Release**  
**Further Dissemination Unlimited**

# Aluminum Solubility and its Effect on Sodium Management

D. L. Herting  
Washington River Protection Solutions

Date Published  
June 2009

To Be Presented at  
Science and Technology Workshop

U.S. Department of Energy  
Richland, Washington

June 9-10, 2009

Prepared for the U.S. Department of Energy  
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy  
Office of River Protection under Contract DE-AC27-08RV14800



P.O. Box 850  
Richland, Washington

#### Copyright License

By acceptance of this article, the publisher and/or recipient acknowledges the U.S. Government's right to retain a nonexclusive, royalty-free license in and to any copyright covering this paper.

  
Release Approval      06/04/2009  
Date

**Approved for Public Release**  
**Further Dissemination Unlimited**

**LEGAL DISCLAIMER**

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

This report has been reproduced from the best available copy.  
Available in paper copy.



# Science and Technology Workshop

**Dan Herting**

June 9, 2009



# ***Aluminum Solubility and its Effect on Sodium Management***

- Mississippi State University, Institute for Clean Energy Technology (ICET)
- Washington River Protection Solutions LLC (WRPS), 222-S Laboratory
- Project funded by U.S. Department of Energy, Office of Waste Processing, EM-21



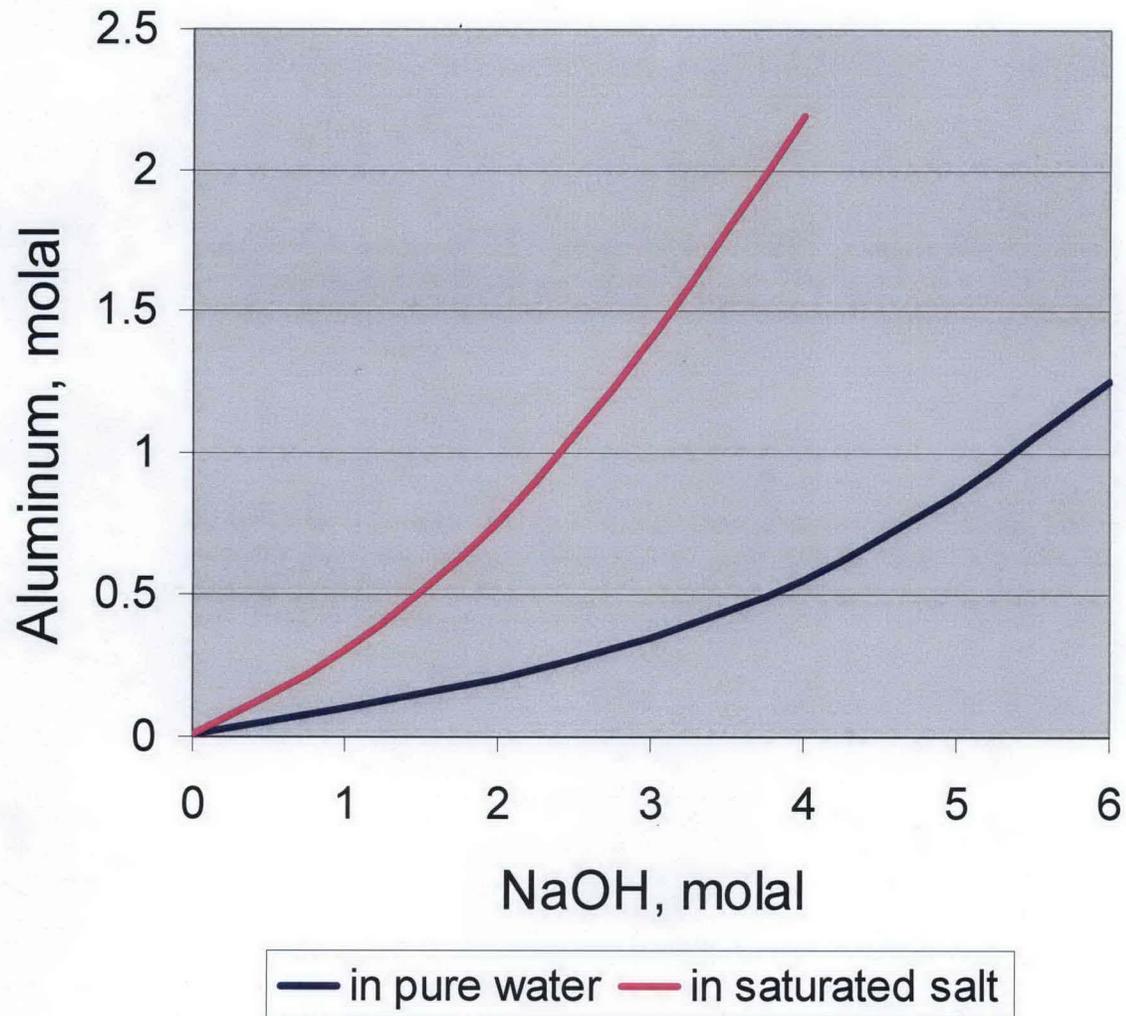
# Agenda

---

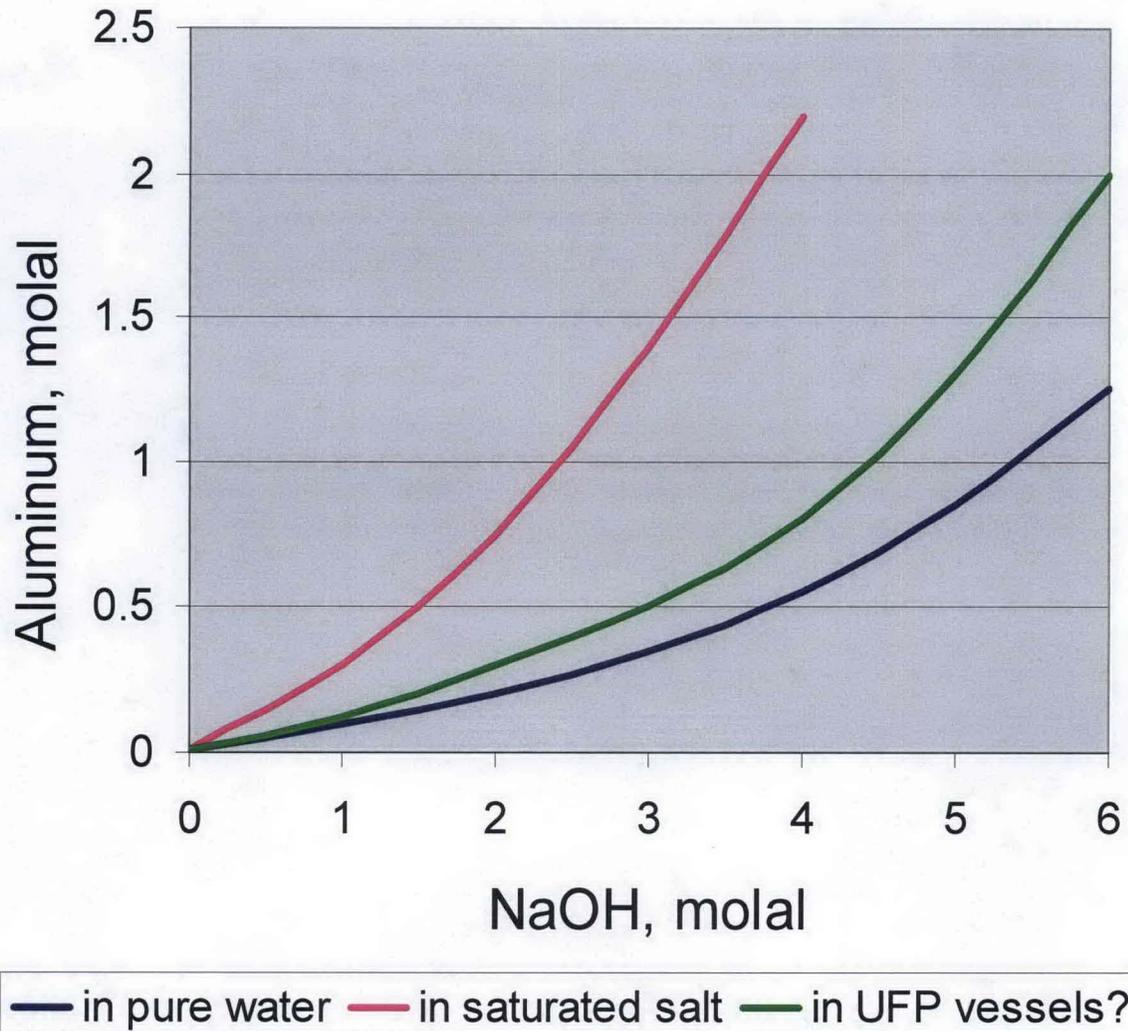
- UFP-01 Leaching Process (Simplified)
- ICET Work Scope
- WRPS Work Scope
- Timetable



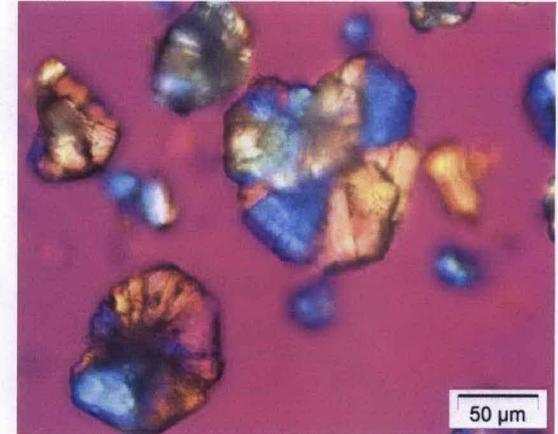
# Gibbsite $[Al(OH)_3]$ Solubility, Known



# Gibbsite $[Al(OH)_3]$ Solubility, Proposed



- Assignment: Measure Al solubility vs. NaOH
  - “Simulated” UFP solution composition
  - Effect of  $\text{NO}_3^-$ ,  $\text{NO}_2^-$ ,  $\text{CO}_3^{2-}$
  - Effect of temperature (25/40/55 °C)
- Result: revised algorithm for NaOH requirement to keep Al in solution (i.e., draw new “green line”)
  - Potential to reduce Na addition at Waste Treatment and Immobilization Plant by up to X%



Gibbsite Crystals

# WRPS Work Scope

- Assignment: Verify ICET solubility data using actual tank waste samples
- Perform UFP leach in hot cell
  - Vary type of waste feed
  - Vary NaOH concentration
  - Measure Al concentration at equilibrium
  - Details not yet planned

