The Nuclear Science and Technology Division

SEMINAR ANNOUNCEMENT

The Return of Nuclear Engineering to Chemistry: Chemical Applications at Nuclear Power Plants and Spallation Neutron Sources

Matthew Francis

Monday, June 2, 2008
10:00 a.m.
Bldg. 5700, O304 Conference Room

A large force driving the nuclear engineering community is the desire for greater performance, be it a larger power rating in our nuclear power plants or a higher thermal flux in our neutron sources. To obtain this greater performance, an increased knowledge in material properties is needed. The desire for greater performance returns the nuclear engineer back to the field of chemistry.

With power up-rates in nuclear plants, the propensity for CRUD deposits on the fuel rods increases. The CRUD deposits then can lead to localized flux depressions and safety issues. One challenge currently facing the nuclear power plant industry is Axial Offset Anomaly (AOA). The development of AOA is due to corrosion products in the coolant, subcooled nucleate boiling at the fuel rods, and soluble boron in the coolant. The current understanding and prevention of AOA will be covered.

Likewise, in an effort to obtain higher performances at neutron sources, the material limitations within the spallation targets become more evident. Due to several of its properties, liquid mercury is the current target material in the spallation neutron sources here at ORNL and J-PARC. Unfortunately, many properties of mercury remain unexplored. In an effort to mitigate the cavitation issue within mercury targets at high beam powers, the solubility of inert gas within mercury for small gas bubble injection or the gas wall concept was explored. The current theoretical and experimental results for solubility parameters in mercury and its impact on mitigation strategies will be discussed.