



Symposium Summary

Radiation Effects in Ceramic Oxide and Novel LWR Fuels

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The Center for Materials Science of Nuclear Fuel (CMSNF) led by the Idaho National Laboratory (INL), organized this symposium on oxide nuclear fuel. The CMSNF is one of the 46 U.S. Department of Energy Frontier Research Centers (EFRC) that aim to establish the scientific foundation for predictive understanding of the effects of irradiation-induced defects on thermal transport in oxide nuclear fuels, and the focus of this symposium was closely tied to the theme of this EFRC. The symposium offered a total of 32 presentations in three sessions that covered both experimental and computational studies on microstructure and thermal transport in oxide fuels, and featured six invited speakers who were experts in radiation damage studies and nuclear fuels from Germany, France, Russia, and the United States.

The symposium was kicked off by the invited talk given by William Weber from University of Tennessee, who presented the audience a comprehensive overview on radiation damage in UO_2 . Various radiation damage mechanisms were reviewed and the presented data were a result of research and development efforts over five decades. Another well received talk was given by Terry Wiss from the Institute for Transuranium Elements (ITU) at Germany. Wiss discussed the state-of-art knowledge and understanding on fission gas behavior and high burn up structures in UO_2 and MOX fuel. The talk was very informative and stimulated a number of questions in the audience.

The symposium also provided a platform for graduate students, postdocs, university professors, national laboratory scientists, and nuclear industry engineers to discuss both the advances and lessons learned in their research and development through contributed talks. One of the symposium was the emphasis on using advanced modeling and characterization tools in understanding fuel behaviors. Taking the fission product transport as an example, Paul Millet from Idaho National Laboratory used 3D phase-field simulations to study the growth and coalescence of intergranular Xe bubbles in UO_2 , while Harn Chyi Lim from Arizona State University presented his work on using a 3D finite element model with microstructure information of UO_2 , created by serial sectioning and electron backscattered diffraction to investigate the grain boundary effects.

The symposium also fostered new collaborations among professionals in both academia and industry, who exchanged ideas and discussed mutual interests in advanced fuel research and development. The symposium also provided opportunities for international collaborations, such as the newly established partnership between the INL led EFRC and the ITU. In the end, the symposium received positive feedback from the speakers and audience, who described it as a “stimulating” and “unique experience”. The CMSNF has planned to organize this symposium again at TMS 2014 with the same focus in oxide nuclear fuel.

—Submitted by Peng Xu and Todd Allen