



Accomplishments and Look Ahead

May 2011

- ATR NSUF 2010 Annual Report has been published. It is available electronically at the ATR NSUF website under "Media."
- The UCSB-2 and Drexel University experiments were both inserted in ATR. ATR started up in early June.
- ATR NSUF hosted Klaus van Benthem from UC Davis on May 9th for the bi-monthly colloquium. Dr. van Benthem spoke on "Imaging Nanofunctionality Using TEM to characterize materials 'At Work'".

June 2011

- User's Week 2011 June 6-10
- Testing of the hydraulic shuttle irradiation system (HSIS) was performed in preparation for the U of Illinois and Drexel capsule experiments.

July 2011

- ATR NSUF hosts Laren Marus, UC Berkeley, and Erik Johnstone, UN Las Vegas, as the ANS student poster winners. Both of these students will tour INL facilities and give a colloquium presentation on their research on July 13, 2011.

June 2011 Bimonthly Report

Noteworthy News

3rd Annual Advanced Test Reactor National Scientific User Facility Users Week Bigger and Better than Ever



Participants of the 3rd Annual Users Week gather on the Steps of University Place in Idaho Falls, Idaho.

A record-breaking number of participants — more than 160 — gathered for the third annual Idaho National Laboratory (INL) ATR NSUF Users Week held June 6-10 at University Place in Idaho Falls, Idaho.

The week-long INL-sponsored event brought together students, faculty and top industry and national

laboratory researchers from 32 universities, various DOE laboratories and private industry. Participants had the opportunity to network, share their research and learn about the latest techniques and capabilities in nuclear science and engineering.

"Users Week gives researchers a firsthand look at the unique nuclear research facilities available through the ATR NSUF," said User Facility Scientific Director Todd Allen. "We're pleased that more and more people are taking advantage of this singular opportunity."

Topics at this year's session covered nuclear materials, fuels, post-irradiation examination and reactor-based technology development. Users Week began with a half-day workshop introducing the unique capabilities of the ATR NSUF. A research forum let participants learn about current research projects being conducted at the User Facility. This forum included a facilitated discussion on potential university/laboratory/industry collaborations.

This year's Users Week was a joint event with the Center for Materials Science and Nuclear Fuels Summer School — a four-and-a-half-day course on how microstructural defects evolve and impact materials inside nuclear reactors.

Participants had the opportunity to tour INL's unique nuclear facilities to see the advanced research capabilities the ATR NSUF has to offer. A

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poster session allowed attendees to share their research and learn about the research of fellow participants. Nuclear Artist Suzanne Hobbs of Pop Atomic spoke on "Art as a Transformative Educational Tool" and brought with her a traveling photography art display. During her presentation at the Users Week dinner, Suzanne announced a new joint initiative with the American Nuclear Society called the Nuclear Literacy Project (www.nuclearliteracy.org), a grassroots-style of educating the American public about nuclear energy through social media. To learn more about Pop Atomic or about the new initiative, visit <http://www.popatomic.org>.

For more information on Users Week or the ATR NSUF, please visit <http://atrnsuf.inl.gov>.



ATR NSUF Scientific Director Todd Allen welcomes participants to Users Week June 6, 2011.

User Week Poster Session Highlights

Eleven posters were submitted for the 2011 ATR NSUF Users Week Poster Session held Thursday, June 9 in the ISU/UI Center for Higher Education building at University Place in Idaho Falls. The poster session gave Users Week participants the opportunity to share their research with other attendees and the top three submissions were awarded certificates and cash prizes.

Sponsors of the poster session included the American Nuclear Society, Westinghouse Electric Company, Illinois Institute of Technology Chapter of Sigma Xi, The Scientific Research Society, The Accelerator and Transmutation Research Program at UNLV, Lightbridge, Boojum Scientific, and Carlo U. Segre from the Illinois Institute of Technology.

Jeff Terry of the Illinois Institute of Technology, Todd Allen of U of Wisconsin and ATR NSUF, and Sean McDeavitt of Texas A&M University were the judging panel. Posters were judged keeping the presenter's aggregate educational level in mind and were awarded points in the following categories: Scientific/Engineering/Technology Approach (35pts), Content (10pts), Thoroughness and Understanding (20pts), Novelty of Approach (15pts), Potential Impact on the Community and/or the Public (10pts), and Clarity and Neatness of Presentation (10pts).

"While there were poster sessions in previous years, this year's competition was unique in that the Users Organization found sponsors to provide cash awards for the winning participants," said Terry.

The three awards went to:

- Golden Neutron Award Winner: Carissa Humrickhouse, Texas A&M, "Characterization of Thermal Properties of DU Metal Microspheres" (\$1000 cash award)
- Silver Neutron Award Winner: Kimberly Clark, UNLV, "Criticality Validation and Reactor Physics Experiment for ATR NSUF" (\$500 cash award)
- Thermal Neutron award winner: Karin Rudman Prieto, Arizona State University, "Grain Boundary Crystallography in UO₂" (\$250 cash award)

Congratulations to the winners and thank you to everyone who participated in the poster session this year.



First Instrumented Lead Experiment Begins Irradiation

The first instrumented lead experiment for the ATR National Scientific User Facility (NSUF) began irradiation in the ATR June 4, 2011 and reached full power and its targeted test conditions on June 6, 2011. In contrast to simple static capsule experiments, instrumented test rigs allow both monitoring and control of specimen temperatures, which is critical to obtaining meaningful high quality data. This irradiation, performed for University of California - Santa Barbara (UCSB), is irradiating a large matrix of light water reactor pressure vessel steels to high fluence at several temperatures. Flux and fluence are the rate of and total (flux times time) neutron impingement, respectively. The experiment is aimed at developing a better understanding and predictive models for the irradiation embrittlement of reactor pressure vessels, which is a technical issue critical to the safe performance of light water reactors (LWR) with licenses extended to 60 years or more.

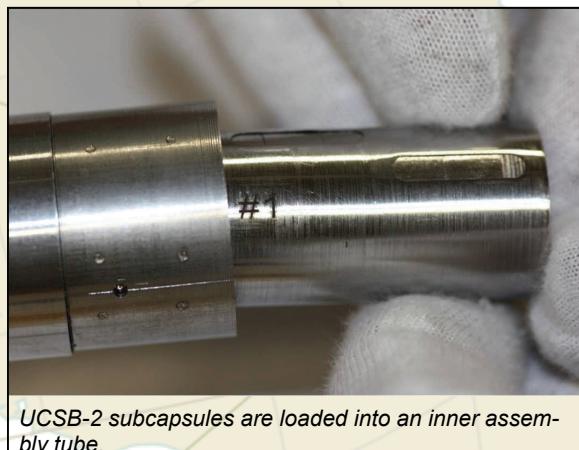
The experiment, "A High Fluence Embrittlement Database and Advanced Test Reactor (ATR) Irradiation Facility for Light Water Reactor Vessel Life Extension" (UCSB-2), addresses a major gap in existing data supporting models to predict embrittlement, manifested as transition temperature shifts (TTS) and irradiation hardening. "Current regulatory models, that are based on low flux surveillance data that do not reach high fluence, under-predict TTS that occur in high flux, accelerated test reactor irradiations at extended life fluences," said Dr. Robert Odette of UCSB, the principal investigator for the ATR NSUF experiment. However, he further noted that this may be "an artifact of high flux test reactor conditions that have been used to reach high fluence."

Connecting the irradiation hardening in the intermediate flux UCSB-2 experiment to results on the same steels irradiated over a wide range of higher and lower fluxes obtained in other experiments, will help resolve the TTS discrepancies noted above. The UCSB-2 experiment will also provide critical information on hardening and TTS by so-called late blooming phases that are not accounted for in current regulatory models.

The experiment contains 180 different alloys in the form of 1400 specimens. The specimens include multipurpose coupons, compact tension fracture specimens, diffusion multiples, and sub-sized tensile specimens. The conceptual design of the test assembly involved a close collaboration between UCSB researchers and INL design engineers. The detailed engineering design, safety analysis, fabrication, reactor insertion and operation of the test rig were carried out by INL staff, and included both thermal and geometric mockups.

When asked about his experience working with the ATR NSUF staff thus far, Dr. Odette commented that it has been "Excellent. Actually, awesome. Mitch Meyer and the engineering team were by far the best team that I have ever worked with in carrying out a complex irradiation experiment over my 40 plus year career." UCSB researchers carried out the scientific design of the experiment, collected the steels, fabricated all the specimens and loaded them into thin wall cups that were then inserted into the test rig at INL.

Instrumented lead experiments are inherently much more complex than static capsule irradiation experiments. "The issue of temperature measurement and control is paramount in such irradiations," explained Dr. Odette. "The division of the capsules into three separate gas mixture zones and the presence of 28 monitor/control thermocouples (TC) involved a very sophisticated design. In addition, getting gas and thermocouple lines into



UCSB-2 subcapsules are loaded into an inner assembly tube.

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the reactor complicates the test train and maintaining proper temperature requires a sophisticated monitoring and control system."

According to INL irradiation testing project engineer Tom Maddock, as of early June the first set of data on the temperatures and gas flows indicated the experiment was in its target zones and everything was running according to plan.

The UCSB-2 experiment will remain in the reactor for approximately one year. After the irradiation is complete, the test rig will be removed and allowed to cool in the canal to reduce the radioactivity level. It will then be disassembled in preparation for a very extensive and complex post-irradiation examination (PIE) phase lasting several years. The PIE will be led by UCSB in close collaboration with ORNL and the DOE LWR sustainability program. Other members of the international project consortium include Bettis Atomic Power Laboratory, the Central Research Institute for the Electric Power Industry in Japan, and Rolls Royce Marine in the UK.

The ATR NSUF looks forward to learning the results of this experiment and the implications they will have for the extended lifespan of LWRs.

Users Working Group Formed

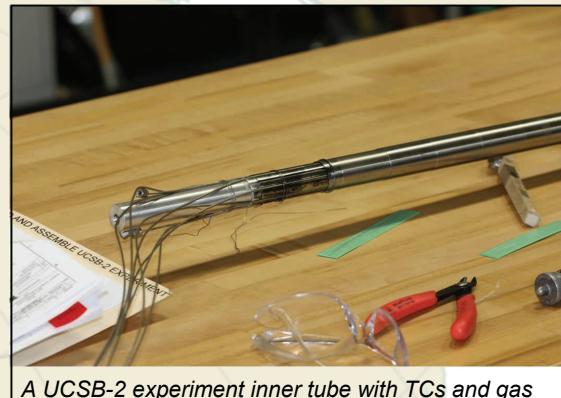
On March 7th, the newly formed ATR NSUF User Organization Executive Committee elected a Chair and Secretary for the organization. Please join us in welcoming Dr. Jeff Terry as Chair, and Dr. David Senor as Secretary.

Jeff is an Associate Professor of Physics at the Illinois Institute of Technology. He has participated in user groups at synchrotron radiation facilities for 20 years. He is an active member of the Users Organization at synchrotron sources in the U.S., Canada, and Europe, and can bring this knowledge to the ATR NSUF Users Working Group. Jeff plans to work closely with NSUF management and users to ensure a robust future for the ATR NSUF.

Dave is a Staff Engineer at Pacific Northwest National Laboratory. He is past Chair of the American Nuclear Society Materials Science and Technology Division and also past Chair of The Minerals, Metals and Materials Society (TMS) Nuclear Materials Committee. He is the lead experimenter for the TMIST series of irradiation tests at ATR and has been involved in irradiation tests at EBR-II, FFTF, JOYO, HFIR, and HFR. Dave joined the Executive Committee because he believes the Users Working Group is a key element in helping ATR NSUF as it works to revitalize the irradiation testing capability in the United States.

The Executive Committee has been very active in its first months of existence. To date the Committee has worked to finalize the User Organization Charter, find sponsors for the ATR NSUF Users Week Poster Session, and set up a Twitter site (<http://twitter.com/#!/ATRNSUOchair>) to keep members up-to-date on activities. Jeff presented a talk on the state of the Users Organization during the 2011 Users Week Workshop where he described the purpose and benefits of this organization to the ATR NSUF.

We look for good things to come from the Executive Committee and encourage you to join the User Organization. To join, please contact Jeff Terry at: jterry@iit.edu.



A UCSB-2 experiment inner tube with TCs and gas lines.