ATR
National Scientific User Facility

The Energy of Collaboration

March 2012 Bimonthly Report

Accomplishments and Look Ahead

January 2012

- ATR NSUF Call for Proposals closed Jan. 25. Twelve proposals were received and are out for review.
- Hosted Jacob Eapen from NCSU as a colloquium speaker.
- Todd Allen visited the University of Manchester/ UK National Nuclear Laboratory.

February 2012

- Todd Allen presented at the OECD NEA Working Group on Fuel Cycles Meeting Feb. 13-16.
- Completed irradiation of the Utah State University experiment capsules.

March 2012

- ATR NSUF exhibited at the 2012 TMS Meeting Mar. 11-15 in Orlando, FL.
- Todd Allen and Donald Moore, a University of Florida graduate student, will represent ATR NSUF at the National User Facility Organization sponsored Exhibit for Congress in the Washington, D.C., Mar. 28-29.

Noteworthy News

ATR NSUF Expands Research Capabilities with New Partner Additions PNNL& Purdue Plus ORNL Facility

The Advanced Test Reactor National Scientific User Facility (ATR NSUF) continues its rapid growth with the addition of two new partners, and an additional capability from one of the current partners. Pacific Northwest National Laboratory and Purdue University – plus one additional facility at current partner Oak Ridge National Laboratory – significantly increase the post-irradiation examination opportunities offered to researchers through the ATR NSUF.

Pacific Northwest
NATIONAL LABORATORY

With the addition of these 2 new partners, ATR NSUF has a total of 10 partners offering a wide range of facilities from reactors, to ion beams, to synchrotron radiation, to specialized post-irradiation examination instruments. Researchers can access any ATR NSUF facility through the peer-reviewed proposal process which is open year-round.

"The addition of these facilities to the NSUF is a strong indicator of the belief that the NSUF model - pairing the best research ideas with the best facilities across the country - is the direction of 21st century nuclear R&D," comments ATR NSUF Scientific Director Dr. Todd Allen.

With the partnership, Pacific Northwest National Laboratory (PNNL) is offering access to its Radiochemistry Processing Laboratory (RPL), Materials Science and Technology Laboratory (MSTL), and irradiation experiment design and fabrication capabilities. The RPL and MSTL facilities offer a wide range of specialized equipment for handling and testing fuels and materials. Capabilities include experiment hardware design, fabrication and assembly, testing facilities for both non-radioactive and radioactive structural materials, and the advanced characterization of unirradiated and irradiated fuels and materials using instruments including transmission electron microscopy (TEM), scanning electron mi-

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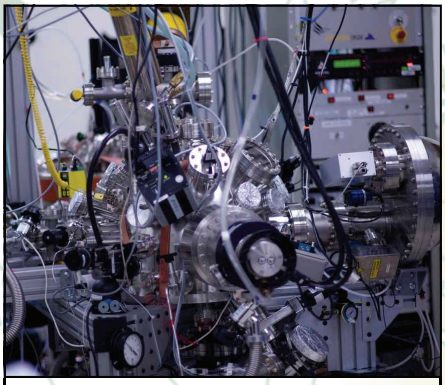
ATR NSUF & Partner Capabilities

	CAES (INL)	INL	IIT	MIT	NCSU	ORNL +	PNNL *	Pur-due*	UC Berke-ley	U of MI	UNLV	U of WI
Reac-tor		X		X	X	X						
PIE	X	X			X	X	X	X	X	X	X	X
Beam-line			X		X					X		X

* added as a partner January 2012
+ additional facilities added to existing partner January 2012


The IMPACT facility at Purdue University.

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croscopy (SEM), and optical microscopy.

Purdue University also joins ATR NSUF as a new partner, providing access to its IMPACT (Interaction of Materials with Particles and Components Testing) facility which offers a wide range of spectroscopy techniques to study the surface of materials. According to their website, the IMPACT facility has the "ability to provide a wide array of characterization techniques and conditions that properly simulate complex environments…by atomic-scale characterization of the evolution of elemental, chemical, and thermodynamic states of ultra-thin film surface and interfaces using complementary surface-sensitive characterization techniques." The IMPACT facility houses a variety of examination instruments including low-energy scattering spectroscopy (LEISS), X-ray photoelectron spectroscopy (XPS), auger electron spectroscopy (AES), extreme ultraviolet reflectometry (EUVR), extreme ultraviolet (EUV) photoelectron spectroscopy and mass spectrometry. For more information about the Purdue IMPACT facility, visit: https://engineering.purdue.edu/CMUXE/Research-IMPACT.html.

Oak Ridge National Laboratory (ORNL) View of East campus

In addition to Oak Ridge National Laboratory's (ORNL) High Flux Isotope Reactor (HFIR) and associated post-irradiation examination facilities, which were offered as partner facilities in 2011, researchers now also have access to ORNL's Low Activation Materials Development and Analysis (LAMDA) Laboratory. The LAMDA facility is a set of multi-purpose laboratories that of-

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New Partners Cont.

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fer a variety of instruments for post-irradiation examination of low dose radiological materials. The LAMDA facility allows researchers to study the basics of radiation effects on irradiated materials through analysis of low-level radiological materials. LAMDA has various post-irradiation examination capabilities including refractory element test stands for tensile testing, optical and scanning electron microscopes, and thermal diffusivity and density measurement equipment. For more information of the LAMDA facility, visit their website at http://www.ms.ornl.gov/NMST/LAMDA.shtml.

Since its designation as a National Scientific User Facility in 2007, ATR NSUF has awarded 41 total experiments involving 23 universities and their collaborators. Find more information about these and other ATR NSUF capabilities at our website at http://atrnsuf.inl.gov/Partners/tabid/57/Default.aspx. To learn more about proposing research, please visit the ATR NSUF website at http://atrnsuf.inl.gov.

ATR NSUF Sample Library Database Under Development

ATR NSUF spring intern Monty Anderson is helping to organize material samples into a consolidated, searchable database.

The ATR NSUF is making its Sample Library more user-friendly. The Library has been available to researchers for several years, but organizing and tracking the samples has always been a challenge. That's where ATR NSUF intern, Monty Anderson, a Mechanical Engineering undergraduate student at Brigham Young University-Idaho, comes in. Monty began his internship February 13, 2012 and is working to catalog the samples into a format that will enable easy searches.

Organizing the samples into a database is important because it allows researchers to quickly search for specific materials and find detailed information on the material of interest. However the benefit goes beyond that. The database will provide ATR NSUF important information on the samples such as how many of a particular type are available, the exact location of a sample, or even who has the sample checked out for an experiment. A good tracking system will ensure that when materials are requested they can be quickly accessed.

Monty began the process by finding the location of each sample (most are at Idaho National Laboratory's Materials and Fuels Complex, but some are at UC Santa Barbara and Los Alamos National Laboratory). Once he has the physical location, he researches the history and status of the sample to compile the information into the database categories.

"I am pooling information on pre- and post irradiated materials that are currently available to researchers," Monty says. "Each material is categorized by specimen type, dimension/size, material

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Sample Library Database Under Development Cont.

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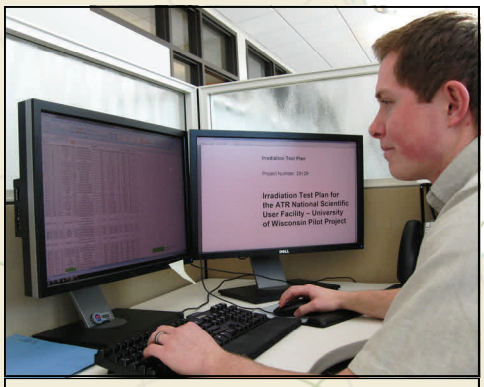
composition, dose and temperature." The database also identifies how the samples were irradiated.

The samples Monty is organizing now are from experiments previously performed by the INL and universities in the ATR, materials from EBR-II (the Experimental Breeder Reactor II now decommissioned at INL's Materials and Fuels Complex), and materials provided by Los Alamos National Laboratory. The NSUF is also currently working with the DOE-NE Light Water Reactor Sustainability Program to obtain pieces of materials being retrieved from decommissioned reactors that could be accessed by NSUF users.

The samples Monty is categorizing are mostly metals, but also include silicon carbide and ceramic materials. Prior to Monty's arrival, INL scientists Paul Lind and Collin Knight had been working to find, catalog, and give each sample from EBR-II a KGT number (a unique identification system developed by INL/ATR NSUF that originates from the initials of the system creators) and Monty is consolidating their information into the new database he is creating.



The samples are being categorized by various material characteristics including dimension/size, material composition, and dose.

Jim Cole, ATR NSUF Chief Scientist and Monty's mentor, is providing guidance to Monty throughout his internship. "There are both historical samples and samples that are being irradiated right now that will be of interest to people researching the radiation effects on materials," Jim comments, "but the information has never been consolidated into a single central repository. That's what Monty is helping us do."

Jim also points out that consolidating all of the detailed information about the samples into one central location plays into one of the main features of a user facility: allowing researchers access to samples and materials they would otherwise not have access to. "The sample library not only compliments the reactor experiments that are currently being irradiated, but it also takes advantage of existing resources," remarks Jim.

Not only is Monty's effort helping the ATR NSUF work through one of its challenges, but the project is also helping him expand his personal knowledge about materials. "This internship is giving me a broader understanding of material properties which will be particularly useful in the design development aspect of engineering," Monty says. "It is helping me expand my knowledge to give me the ability to select the best materials for the right project. I will be able to apply this knowledge later on in my engineering career."

The beta Sample Library database is anticipated to be available via the ATR NSUF website in April of 2012.

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Faculty & Student Research Team Proposal Awarded for Summer 2012

Congratulations to University of Michigan faculty Emmanuelle Marquis and students Reshma Mathew and Yan Dong, and INL staff member Sebastien Teysseyre for their recently awarded Faculty/Student Research Team (FSRT) proposal titled, “Statistical characterization of irradiated and oxidized microstructures: correlating state-of-the-art techniques and length scales.” This summer the team will conduct their research utilizing a variety of microscopy tools available through ATR NSUF at the Center for Advanced Energy Studies MaCS (Microscopy and Characterization Suite) laboratory.

This University of Michigan/INL FSRT aims to develop a quantitative approach for targeted characterization of microstructural defects in both irradiated and oxidized Zirconium alloys and fuels. The team’s collaboration will bring Marquis’ expertise in atomic scale characterization and grain boundary and interfacial behaviors together with Teysseyre’s interest in stress corrosion cracking and irradiated materials.

"One of the purposes of the FSRT program is to give researchers and students access to world-class capabilities and equipment and to introduce INL researchers to faculty and students who have similar research interests," says Jeff Benson, ATR NSUF Education Coordinator. The ATR NSUF Faculty and Student Research Team (FSRT) program is an opportunity for faculty and students to spend part of the summer performing research in collaboration with an INL scientist or engineer. "Faculty and students have a chance to learn about how a national laboratory works and how it is different than a university," Jeff comments.

Each of the six proposals submitted to ATR NSUF for the call that closed December 16, 2011 were evaluated by an independent review committee and scored based on Technical Merit (50%), Feasibility (25%), and Team Qualifications (25%). All FSRT projects are required to result in increasing the research capability of ATR NSUF, however, ATR NSUF specified 11 areas of interest for fiscal year 2012. To learn more about Faculty and Student Research Team and the proposal criteria, visit http://atrnsuf.inl.gov/FacultyandStudents/FacultyStudentResearchTeams/tabid/76/Default.aspx.