

## NUCLEAR SCIENCE AND TECHNOLOGY DIVISION

### Completed and Ongoing Projects:

“On the Phase Constitution of LANL Inert Matrix Fuel - Qualitative and Quantitative Phase Analysis of ‘Cold’ Nitride-based Inert Matrix Fuels using X-Ray Powder Diffraction, Least Square and Rietveld Structure Refinement” technical report submitted to Los Alamos National Laboratory, December 2004. This project is part of direct support by HRC researchers to the DOE Advanced Fuel Cycle Initiative.

“High Temperature Heat Exchanger Project Annual Report,” November 2004. Submitted to the U.S. Department of Energy Office of Nuclear Energy, Science & Technology Nuclear Hydrogen Initiative.

“University of Nevada, Las Vegas Transmutation Research Program Annual Report Academic Year 2003-2004,” September 2004. Submitted to the U.S. Department of Energy Office of Nuclear Energy, Science & Technology Advanced Fuel Cycle Initiative.

“Delivering a Downhole, Real-Time Monitoring System for In Situ Measurements of Tritium,” Final Report, July 1, 2004. Submitted to the Nevada Environmental Research Park (NERP) Cooperative Agreement (completed).

“Groundwater Characterization at Yucca Mountain – Task 2: Surface Complexation and Solid Phase Dissolution.” This project is a new DOE Yucca Mountain Cooperative Agreement project starting November 2004.

“UNLV Transmutation Research Program – Task 26: Fundamental Chemistry of U and Pu in the TBP-Dodecane-Nitric Acid System.” This project is a new DOE Advanced Fuel Cycle Initiative Cooperative Agreement project starting August 2004.

“UNLV Transmutation Research Program – Task 19: Dissolution, Reactor, and Environmental Behavior of  $ZrO_2$ -MgO Inert Fuel Matrix.” This project is a new DOE Advanced Fuel Cycle Initiative Cooperative Agreement project starting May 2004.

“UNLV Transmutation Research Program – Task 6: Neutron Multiplicity Measurements for the AFCI Program.” This is a continuing project under the DOE Advanced Fuel Cycle Initiative Cooperative Agreement.

“Evaluation of US and UC-US Solid Solution Oxidation by  $CO_2$ .” This is a new NERI project subawarded by the Massachusetts Institute of Technology.

“Engineering *Deinococcus radiodurans* with a Polyphosphate-based Mechanism for Bioprecipitation of Actinides.” This is an ongoing project sponsored by the U.S. Department of Energy.

“Enhanced Control of PWR Primary Coolant Water Chemistry Using Selective Separation Systems for Recovery of Enriched Boric Acid.” This is a continuing NERI project subawarded by the Massachusetts Institute of Technology.

“Development of a Fundamental Understanding of the Complexation of Am, Cm, Np, and Pu with Organic Ion Exchange Resins.” This is a continuing project for the Presidential Early Career Award for Scientists and Engineers (PECASE) subawarded by Los Alamos National Laboratory.

Transmission Electron Microscopy User Facility: the TEM was officially accepted from the vendor in January 2004. The first samples were examined in July 2004 after the completion of a Sample Preparation User Facility in June 2004. NSTD staff interact with students from the colleges of Sciences and Engineering to perform their research (completed).

High Activity Actinide Chemistry Laboratory: facility modifications were completed November 9, 2004. The laboratory will go hot in early 2005 when radionuclides are delivered.

Inductively Coupled Plasma Atomic Emissions Spectroscopy User Facility: facility modifications were completed in November 2004 and instrument installation and training was completed in December 2004 (completed).

Radiochemistry Ph.D. Program: the Board of Regents approved the new program proposal on March 19, 2004. Ken Czerwinski was appointed the director of the program in April 2004. The program had its inaugural class of four students in Fall term 2004 (completed).

Materials and Nuclear Engineering M.S. Program: the Board of Regents approved the new program on June 4, 2004. NSTD staff were involved in the development and course planning for the new program which was initiated Fall term 2004 (completed).

Actinide Chemistry Group: a new group established in June 2004 within the NSTD led by Ken Czerwinski to coordinate NSTD activities including integration with the UNLV Ph.D. program in Radiochemistry.

Structure and Solid Phase Analysis Group: a new group established in December 2004 within the NSTD led by Thomas Hartmann to coordinate NSTD solid phase analytical activities including integration with capabilities found in other laboratories on the UNLV campus.

### **Publications:**

T. Beller, D. Curtis, D. Beller, A. Rimsky-Korsakov, and T. Ward, “The UNLV Neutron Multiplicity Detector System,” *Proceedings, OECD Nuclear Energy Agency*

- Eighth Information Exchange Meeting on Actinide and Fission Product Partitioning & Transmutation, 9-11 November 2004, Las Vegas, Nevada.
- A.E. Hechanova, "Waste Management Research Project," *Proceedings*, International Youth Nuclear Congress, Ontario, Canada, May 9-14, 2004.
- L. Ma and K.-M. Chang, "Effects of Different Metallurgical Processing on Microstructures and Mechanical Properties of Inconel Alloy 783," *Journal of Materials Engineering and Performance*, Volume 13 (1), 32-39, February 2004.
- L. Ma, "Comparison of Different Sample Preparation Techniques in TEM Observation of Microstructure of INCONEL Alloy 783 Subjected to Prolonged Isothermal Exposure," *Micron*, 35 (2004): 273-279.
- D. Curtis, D. Beller, C. Hull, A. Rimsky-Korsakov, and T. Ward, "Modeling Neutron Multiplicities in a 60-element <sup>3</sup>He Detector System," *Proc. of the Sixth International Meeting on Nuclear Applications of Accelerator Technology (AccApp 03)*, American Nuclear Society, pp. 190-194, 2004.

### **Services:**

Hosted six Russian visitors from the Institute for Physics and Power Engineering to install a lead-bismuth cooled loop at UNLV from Dec. 4 to 18, 2004.

Hosted the Eighth Information Exchange Meeting on Actinide and Fission Product Partitioning and Transmutation for the OECD Nuclear Energy Agency from Nov. 9 to 11, 2004. 120 participants from 22 countries attended.

Staffed a display on radiation and energy at the Pahrump Fall Festival from Oct. 1 to 3, 2004 and a display on energy and the environment at the Earth Day festival at Honeysuckle Park, Pahrump, on April 24, 2004.

Research staff taught RDCM-701 (Applied Nuclear Physics) Fall term 2004 for the Radiochemistry Ph.D. Program.

Research staff was interviewed on Channel 3 by Mitch Trustwell on August 17, 2004 and on radio (Our Metropolis) by Hal Rothman on November 8, 2004, discussing nuclear waste management and alternatives.

"Nuclear projects at UNLV," invited lecture at the Las Vegas Senior Center, August 12, 2004.

Hosted a U.S. Department of Energy meeting on Energy Conversion at UNLV on May 18, 2004.

Hosted visitors from Italy's nuclear waste program, organized through the U.S. State Department on April 23, 2004.

UNLV Chemistry Department External Review, "Report of the External Review Committee," Final Report, May 12, 2004. Anthony Hechanova was one of five members on the committee that met from April 18-21, 2004.

Volunteer judges for the Southern Nevada Regional Science and Engineering Fair hosted at UNLV on April 17, 2004.

Yucca Mountain Tour organized for the UNLV community. Thirty students attended on April 6, 2004.

Hosted a U.S. Department of Energy workshop on Gen IV/NHI Materials and Membranes March 18 and 19, 2004.

Boy Scout Merit Badge on Atomic Energy lectures provided at the Joseph, Husband of Mary Catholic Church Hall for about 30 boy scouts on March 15, 22, and 29, 2004.

Hosted the Monte Carlo N Particle with extra high energies (MCNPX) Training at UNLV, Jan. 12-16, 2004.

Research staff provided 5 guest lectures for UNLV courses involving nuclear science and technology.

Research staff participated as professional reviewers for *Nuclear Technology*, the *Journal of Health Physics*, the International Science and Technology Center, and a variety of conferences.

Committee members for the following students who defended their thesis in 2004:

Steve Curtis, Health Physics

Satish Dronavalli, Mechanical Engineering

Phani Gudipati, Mechanical Engineering

Mohammad Hossain, Mechanical Engineering

Srinivasa Kukatla, Mechanical Engineering

Vikram Marthandan, Mechanical Engineering

Venkata Potluri, Mechanical Engineering

Ramprashad Prabhakaran, Mechanical Engineering

Sudheer Sama, Mechanical Engineering

Venkataramakrishnan Selvaraj, Mechanical Engineering

Satish Subramanian, Mechanical Engineering

Anand Venkatesh, Mechanical Engineering

Bhagath Yarlalagadda, Mechanical Engineering