VANDERBILT UNIVERSITY School of Engineering

CRESP

You are invited to attend a

Short Course

Introduction to Nuclear Chemistry and Fuel Cycle Separations

December 16-18, 2008

Vanderbilt University School of Engineering
Department of Civil and Environmental Engineering
Student Life Center
1st Floor Ballroom AB, 310 25th Ave South
Nashville, TN 37240

Course Objective: To provide an introduction to the chemistry and separations processes of isotopes important to nuclear fuel cycles including: Nuclear fuel cycle fundamentals; Mining, milling and enrichment; Nuclear radiation; Reactors and fuels; Spent fuel reprocessing; Non-aqueous processes; Precipitation/crystallization/sorption; Sorbent development and analysis; Complexation reactions; Separations equipment; Waste forms; Environmental transport; Role of modeling; Role of risk assessments; and Nuclear proliferation and safeguards.

Targeted Audience: Professionals in management, oversight and regulation of nuclear processes and facilities. Also appropriate for graduate students in engineering and sciences planning a career focused on nuclear processes and as an introduction for professionals that will be engaged in nuclear separations processes and facility design.

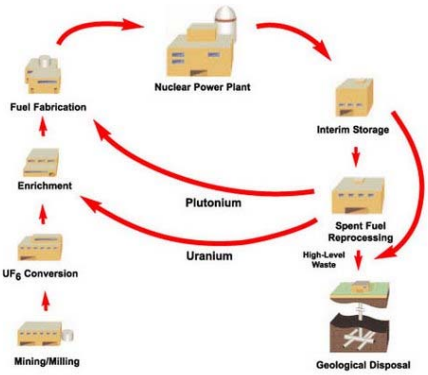
Organizing Committee: Dr. Raymond G. Wymer, Chair; David S. Kosson, Vice-Chair, Vanderbilt University; Cynthia Atkins-Duffin, Lawrence Livermore National Laboratory; David dePaoli, Oak Ridge National Laboratory; Kathryn Higley, Oregon State University; Terry Todd, Idaho National Laboratory.

Cost and Registration Process: The cost of the 3 day course is $250. ENROLLMENT IS LIMITED. Registration and travel support may be available for full-time graduate students. (Email Lisa Bliss at lbliss@cresp.org for information.) Payment may be made by check or credit card. Registration form must be completed and returned to: Randi Hall

VU Station B #351831
2301 Vanderbilt Place
Nashville, TN 37235-1831

Registration confirmation will be sent by email.
For additional information contact Lisa Bliss at lbliss@cresp.org or 866-914-3244 (toll free)

This course is supported by CRESP, a cooperative agreement with the Department of Energy, and partially by a grant from the U.S. Nuclear Regulatory Commission.



Introduction to Nuclear Chemistry and Fuel Cycle Separations

December 16 – 18, 2008

Topics and Speakers:

Tuesday December 16

8:00 – 8:30 Continental Breakfast

Welcome **David S. Kosson, Vanderbilt University**

Course Introduction **Mark Gilbertson, Department of Energy**

1. **Nuclear fuel cycle fundamentals** **Frank L. Parker, Vanderbilt University**

   a. The Nuclear Fuel Cycle (milling, additional refinement including conversion, enrichment, reprocessing, waste management, and waste disposal), b. Fission yields, c. Actinide elements, d. Important fission products, e. Problems created during Cold War (Waste tanks, Site Contamination-radioactive and non-radioactive, Stewardship of abandoned sites).

Break

2. **Mining, milling and enrichment of U ores** **Clarence Hardy, Nuclear Fuel Australia, Ltd**

   a. Ore processing (By ore type-sub-surface, By method – acid, alkaline carbonate, Other) b. conversion, c. Enrichment (Calutron, Gaseous diffusion, Centrifugation, Metal-aqueous phases – Li isotope, Laser).

3. **Nuclear Radiation** **Robert Sindelar, Savannah River National Laboratory**

   a. Radiolysis; b. Radiation induced reactions; c. Considerations in materials selection.

12:30 – 1:30 Box lunch

4. **Reactors and fuels** **Allan Croff, ORNL, ret., and USNRC**

   a. LWR, b. BWR, c. LMFBR, d. HTGR, e. CANDU.

5. **Spent fuel reprocessing** **Robert Jubin, Oak Ridge National Laboratory**

   a. Separations (Head-end treatment (chop/leach), Purification by solvent extraction (Pu, U, ^{237}Np, ^{241}Am, Cm), Ion exchange – organic/inorganic) b. Distillation (Vacuum, Steam stripping, Acid recovery) c. Off-gas treatment (Iodine, Noble gases, $^{14}CO_2$, ^{3}H, v) Other (Ru, et al.)).

Break

6. **Non-aqueous Processes** **Mike Goff, Idaho National Laboratory**

a. Volatility/vaporization: (UF6 (Reprocessing, Purification of UF6), Molten salt systems, Liquid metal systems) b. Electrolytically-driven processes (Electrolytic dissolution, Electro-deposition, Electro-reduction, Electrolytic decomposition).

Wednesday December 17, 2008
8:00 – 8:30 Continental Breakfast

7. **Precipitation/crystallization/sorption** **Gordon Jarvenin, Los Alamos National Laboratory**

a. Pu3(PO4)4, b. Pu(C2O4)2, c. Hydroxides, d. Carbonates of divers elements, e. Sorption on solids (MnO2 , Al2O3 , Fe(OH)3).

8. **Complexation Reactions** **Gregory Choppin, Florida State University**

a. Carbonates - uranyl tricarbonate, b. Thiocyanates – actinides, c. Chlorides and sulfates, d. TBP adducts (Uranium, Plutonium, Technetium).

Break

9. **Separations equipment** **Jack Law, Idaho National Laboratory**

a. Pulse columns, b. Mixer-settlers, c. Centrifugal contactors.

12:30 – 1:30 Box Lunch

10. **Waste forms** **John Vienna, Pacific Northwest National Laboratory**

a. Glass, b. Grout, c. Metal, d. Other.

11. **Environmental Transport** **Kathryn Higley, Oregon State University**

a. Natural barriers, b. Engineered barriers, c. Other.

Break

12. **The Role of Modeling** **David dePaoli, Oak Ridge National Laboratory**

Thursday December 18
8:00 – 8:30 Continental Breakfast

13. **Sorbent development and analysis for column separations** **Lawrence Tavlarides, Syracuse University**

14. **The Role of Risk Assessments** **B. John Garrick, NWTB Chairman**

a. Risk Assessment Principles; b. Risk Assessment in Spent Fuel Reprocessing

15. **Nuclear Proliferation and Safeguards** **Cynthia Atkins-Duffin**
Lawrence Livermore National Laboratory

12: 00 Course Adjourned

Course Location:
Vanderbilt University
Student Life Center
310 25th Ave South
Nashville TN 37240

All course sessions December 16-18, 2008 will be held at the Vanderbilt University Student Life Center (Ballroom AB, First Floor), located at 310 25th Avenue South on the Vanderbilt University campus in Nashville, Tennessee. The Student Life Center is located .4 mile from the Holiday Inn Select Hotel. Very limited parking is available nearby on campus.

Directions: http://www.vanderbilt.edu/studentlifecenter/directions.html

Vanderbilt University Map: Parking areas indicated in red.

Hotel Accommodations:
Holiday Inn Select Nashville-Vanderbilt (DWTN)
2613 West End Ave
Nashville, TN 37203 UNITED STATES
Hotel Front Desk: 1-615-327-4707 | Hotel Fax: 1-615-327-8034
http://www.ichotelsgroup.com/h/d/sl/1/en/hotel/bnavb/at-a-glance/media/pt

A block of rooms has been reserved at the Holiday Inn Select Nashville-Vanderbilt from Monday December 15 to Thursday December 18 at a special rate of $106/night. To make a reservation call 615-327-4707 or 877-327-4704, and designate the "Vanderbilt Nuclear Chemistry Course" group rate code "NSS". Reservations may also be made online. **All reservations must be confirmed prior to December 3 in order to receive the group rate.**

The Holiday Inn Select at Vanderbilt is within walking distance (0.4mi) of the Student Life Center. Those guests who do not wish to walk may utilize the services of the hotel shuttle. Please request a shuttle to and from the Student Life Center at the front desk of the hotel.

Driving Directions from Airport to Hotel
I-40 West To Broadway Exit, Turn Left & Stay Right On West End Ave. Hotel Is On The Left Approx. 2 Miles From I-40. I-40 East To Broadway Exit, Turn Right & Stay To Right On West End Avenue Hotel Is On The Left Approx. 2 Miles From I-40.

Other Accommodations

Nashville Marriott at Vanderbilt University
2555 West End Avenue
Nashville, Tennessee 37203
Phone: 615-321-1300
Fax: 615-321-1400

Courtyard Marriott Nashville Vanderbilt/West End
1901 West End Avenue
Nashville, Tennessee 37203
Phone: 615-327-9900
Fax: 615-327-8127
Toll-free: 1-800-245-1959

Loews Vanderbilt Hotel
2100 West End Avenue
Nashville, Tennessee 37203
Phone: 615-320-1700
Fax: 615-320-5019

Hampton Inn Nashville Vanderbilt
1919 West End Avenue
Nashville, Tennessee 37203
Phone: 615-329-1144
Fax:615-320-7112
Hampton Inn Reservations: 1-800-HAMPTON

Embassy Suites Hotel Nashville at Vanderbilt
1811 Broadway
Nashville, Tennessee 37203
Phone: 615-320-8899
Fax: 615-321-8881

Hampton Inn & Suites At The University
2330 Elliston Place
Nashville, Tennessee 37203
Phone 615-320-6060
Fax: 615-327-4723
Toll-free: 1-888-880-5395

C R E S P

The Consortium for Risk Evaluation with Stakeholder Participation

*Consortium Universities: **Vanderbilt University**, Howard University, Oregon State University, Robert Wood Johnson Medical School, Rutgers University, University of Arizona, University of Pittsburgh, University of Washington*

A consortium of universities working to advance cost-effective, risk-informed cleanup of the nation's nuclear weapons production facility sites and cost effective, risk-informed management of potential future nuclear sites and wastes. Supported through a cooperative agreement with the Department of Energy. *www.cresp.org*

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December 16-18, 2008

Registration Form

Name _____
Title _____
Institution/Organization _____
Department/Unit _____
Mailing Address _____
City_____ State/Prov. _____ Postal Code _____
Work Phone_____ Fax _____
E-mail _____

Conference Registration

Registration Fee	Amount Enclosed
$250	$ _____

Method of Payment

___ Purchase Order ___ Check
(U.S. funds only payable to Vanderbilt University – NFC Course)

Charge my ___ Visa ___ Mastercard
Card # _____
Expiration Date _____
Name as it appears on the card _____

Signature _____

Total $ _____

Registration Mailing Address:

Randi Hall
VU Station B #351831
2301 Vanderbilt Place
Nashville, TN 37235-1831

Phone: (615) 322-2697

Registration confirmation will be sent by email.