

The CSRA Chemist

Savannah River Section
of the

American Chemical Society



The Fall Schedule is Here!

We're doing something special for our first meeting. We are having a half day symposium in Savannah Georgia with the Coastal Georgia Section.

October 1, 2004

1:00 to 6:00 pm

Armstrong Atlantic State University

Savannah, GA

Science Center 1407

October 20, 2004

Joint Meeting of ACS, ANS, AiChE, ASME

Dr. Todd Wright, Partridge Inn

The Calendar

September

- 14 -- College Night at the Colisseum - ACS Booth

October

- 1 -- Nuclear Chemistry Symposium, Coastal Gerogia Section,
Armstrong Atlantic State University
[see details on next page]

- 20 -- Joint Professional Society Meeting with ANS, AiCHE, ASME,
and the ACS at the Partridge Inn, Augusta, Ga - Dr. Todd
Wright, Director of the Savannah River National Laboratory
will be the featured speaker.

- 17-23 -- National Chemistry Week
Health and Wellness is the Theme

WOW that's Chemistry and SEED also held in October by ASU and
USCA as Science Outreach Programs

November

- 9, Steven Dutch, U. WI - Green Bay, Tour Speaker,
A Scientist goes to Desert Storm
, at Fort Discovery, Augusta

- 10-14, SERMACS, Research Triangle Park, NC

December

- 3 -- Holiday Party, -- Recognitions and Introduction of New Officers
at the North Augusta Community Center

TENTATIVE 2005

January 20

William F. Carroll, OxyChem,
From Garbage to Stuff: How We Recycle Plastics

March 10

W. H. Breazeale, College of Charleston,
The H.L. Hunley - Recovery and Preservation

April 19

Ellen E. Burns, Office of Congressman Ehlers ,
The Chemistry of Congress

September 14

Ariel Fenster, McGill University,
Scienc and Arts, Facts and Fakes,

November 16

Jeffrey I. Seeman, Philip Morris Research Center,
The Human Side of Science

Nuclear Chemistry Symposium

“Nuclear Chemistry and the Savannah River Site”

We are going on a road trip! Find somebody to travel with to Savannah, Georgia for this special half day seminar on Friday, October 1, 2004. Its less than 3 hours away.

Symposium is sponsored by both the Coastal Georgia and the Savannah River Local Sections with special funding by the American Chemical Society. Six technical presentations will highlight the chemical, environmental, and historical impacts of the Savannah River National Laboratory.

1:00-3:00 pm Presentations [see next page]

3:00-3:15 pm Break [light refreshments]

3:15-5:00 pm Presentations

5:00-6:00 pm Reception (hors d'oeuvres)

**Armstrong Atlantic State University,
Savannah, GA,
Science Center 1407**

For information and RSVP:

Will Lynch, Coastal Georgia Local Section, Councilor,
Phone 912-921-2337 or lynchwill@mial.armstrong.edu

[Free and open to the public]

for directions:

<http://chemistry.armstrong.edu/lynch/cgacs.html>

Presentation Schedule

**The Purex Process at Savannah River,
Dr. David G. Karraker, SRNL**

**Plutonium Redox Transformation in Savannah
River Site Soils: Implications on Waste
Processing,
Dr. Steven M. Serkiz, SRNL**

**Inorganic Based Ion Exchange Materials for
Radiochemical Separations,
Dr. David Hobbs, SRNL**

**Challenges in Radiological Characterizations of
SRS Waste,
Dr. David P. DiPrete, SRNL**

**Advances in Analytical Radiochemistry,
Dr. Raymond A. Sigg, SRNL**

**A Historical Perspective of the Savannah River
Site,**

Dr. Ken Stephens, Dr. Mal McKibben

The Purex Process at Savannah River

D. G. Karraker

Actinide Technology Section

Savannah River National Laboratory

Aiken, SC

The Purex process separates uranium, plutonium and fission products by solvent extraction into tri-n-butyl phosphate (TBP). The process was first operated on a large scale at Savannah River in 1954, and has since been adopted by the British, French, Russian, and Japanese for the processing of irradiated uranium and plutonium from both power and production reactors. The process extracts uranium(VI) and plutonium(IV) as nitrate complexes, separates U from Pu by reducing Pu to the poorly extractable Pu(III) valence. Details of the process will be presented and its early history of operation at Savannah River will be included.

Plutonium Redox Transformations in Savannah River Site Soils: Implications on Waste Processing

**Steven M. Serkiz^(a), Daniel I. Kaplan^(a), Robert A. Fjeld^(b), Brian Powell^(b),
Elmer L. Wilhite^(a)**

^(a)Savannah River National Laboratory

^(b)Clemson University

The environmental mobility, and therefore many waste processing decisions, for Pu is profoundly influenced by its oxidation state with Pu(IV) being 2 to 3 orders-of-magnitude slower moving than Pu(V) or (VI). The pH and Eh of natural environments is such that Pu often exists simultaneously as Pu⁴⁺ and Pu^{VO₂⁺} and, to a much smaller extent, as Pu³⁺ and Pu^{VI₂O₂²⁺}. Many iron (oxy)hydroxide minerals, humic acid, and natural sediments can reduce Pu from the mobile oxidized forms to the less mobile reduced forms.

We have examined Pu redox transformations in: (1) binary systems of containing single synthetic minerals (e.g., magnetite, goethite, and hematite) present in Savannah River Site (SRS) soils; (2) Pu sorption to uncontaminated SRS soils; and (3) Pu leaching from lysimeters containing various forms of well-characterized Pu in known oxidation states that were exposed to the environment at the SRS for up to 9 years.

Oxidation and reduction rates as well as the magnitude of sorption were measured by these three approaches and these laboratory data were used as input into a reactive transport model that forms the basis for near-surface disposal decisions at the SRS.

**Inorganic Based Ion Exchange Materials for Radiochemical Separations,
D. T. Hobbs,¹ M. D. Nyman,² and A. Clearfield,³**

¹ Savannah River National Laboratory, Aiken, SC 29808

² Sandia National Laboratory, Albuquerque, NM 87185

³ Department of Chemistry, Texas A&M University, College Station, TX 77842

Nuclear materials production in the United States has produced large amounts of highly radioactive wastes. Wastes stored at the Savannah River and Hanford sites exhibit high alkalinity and high ionic strength. Cost effective disposal of the high-level nuclear wastes requires highly efficient radiochemical separations processes. Ion exchange materials have shown promise to separate fission products (e.g., cesium and strontium) and actinide elements (e.g., plutonium and neptunium) from the high-level waste solutions prior to disposal. Monosodium titanate (MST), a hydrous metal oxide, is the baseline material for the removal of ⁹⁰Sr and alpha-emitting radionuclides (principally ²³⁸Pu, ²³⁹Pu, ²⁴⁰Pu and ²³⁷Np) from alkaline waste solutions at the Savannah River Site. MST exhibits excellent performance characteristics for strontium removal. Plutonium removal is also good, but problematic at the estimated bounding concentration. We are currently developing new inorganic materials with increased capacity and removal kinetics. We will present results evaluating the performance of these new materials with simulated waste solutions.

Challenges in Radiological Characterizations of SRS Waste**D.P.DiPrete****SRNL**

Savannah River Site Processes as well as Site clean-up efforts generate a steady stream of radiological waste materials. Prior to disposition of a waste package to a waste treatment, storage, or disposal facility on Site, such as the E-Area Low Activity Waste Vaults, or elsewhere, such as the Waste Isolation Pilot Plant, characterization of that waste package by the generator is required. Each receiving facility has its own set of waste acceptance criteria (WAC). Typically, where available, the waste generator uses process knowledge as a starting point for the characterization. Eventually analytical data is required to back up the processes working characterization. Material with an uncertain history always requires a suite of analyses.

continued...

WAC's in general are fluid documents, with steady streams of revisions altering required lists of analytes, as well as required detection limits. Analytically, WAC analyses pose significant challenges. Detection limit requirements of the WAC's for various radionuclides are often driven by similar criteria which dictate requirements for environmental monitoring samples, such as drinking water standards or intruder scenarios. However, methods designed for environmental analyses are often more designed to concentrate one analyte relative to another, rather than to analyze a trace analyte in the presence of overwhelming quantities of interfering analytes. Widely varying Site matrices pose significant challenges in that wide varieties of complexing agents can be present, which interfere with routine established methods. Unusual radionuclides rise up and fall off the WAC lists continually, radionuclides for which no established radiochemical methods exist. Historical radiochemical methods often become problematic to run under current environments due to chemical hazards or waste generation issues. SRNL continually develops new radiochemical methods which strive to meet the requirements of the various evolving WAC's. Existing methods are under constant development to drive detection limits ever lower in the face of high levels of interfering analytes.

Elections

Yes it is that time again. The nominations committee is placing the following names on the ballot. A member may write in a candidate on the ballot but must obtain an agreement to serve prior to the write-in. Ballots will be mailed to members.

Chair Elect - Dan McCabe

Treasurer - Eric Zuckerman

Secretary - Scott McWhorter

Councilor - Chris Bannochie

Aternate Councilor - Stephanie Myers

Coming Events - Notes from our Program Chair - Mark Barnes

October 20, 2004 - Joint Professional Society Dinner Meeting w/ Dr. Todd Wright

A joint dinner meeting with the local chapters of the American Nuclear Society, American Institute of Chemical Engineers, and the American Society of Mechanical Engineers will be held on Wednesday, October 20, 2004 at the Morris Partridge Ballroom at the Partridge Inn in Augusta. Social hour will start at 6:00 pm with a cash bar. Dinner will follow at 7:00 pm followed by our guest speaker, Dr. Todd Wright, Director of the Savannah River National Laboratory. Members and guests are invited to attend. Please contact Beth Ellis, 725-2605, for reservations by Tuesday, October 12, 2004. Dinner will include house green salad, marinated vegetable salad, fresh baked rolls, fresh vegetable medley, southern fried rice, roasted garlic mashed potatoes, pecan crusted chicken with peach salsa, marinated flank steak with wild mushroom raguot, pecan pie, cheesecake, red velvet and chocolate cake. The cost will be \$24 per person (at the door). Contact Mark Barnes, 725-2104, or Charles Crawford, 725-8049 for more information.

November 9, 2004 - Dinner Meeting at Fort Discovery

The American Chemical Society Savannah River Section will hold a dinner meeting at Fort Discovery in Augusta, on Tuesday, November 9, 2004, 6:30 pm (Social), 7:00 pm (Dinner), 7:45 pm (Speaker). The guest speaker, Dr. Steven Dutch, will present a talk on "A Scientist Goes to Desert Storm". Dr. Dutch's Abstract and biography are attached. Members and guests are invited to attend. Please contact Beth ellis, 725-2605, for reservations by Thursday, November 4, 2004. Dinner will include sliced roast beef, vegetable lasagna, salad, string beans, rolls, cookies, tea and coffee (\$15 per person at the door). Contact Mark Barnes, 725-2104, or Charles Crawford, 725-8049 for more information.

December 3, 2004 - Wine and Cheese Meeting

The American Chemical Society Savannah River Section will hold a wine tasting seminar on Friday, December 3, 2004 at the North Augusta Community Center. The meeting will start at 6:30 pm. Details will be provided in a future newsletter.

Here is an article for the newsletter from my committee. We are trying to get broader input on the issue of Globalization. -- Christopher J. Bannochie, Ph.D. - Section Councilor

CEPA and Globalization

Globalization, offshoring, outsourcing, insourcing, jobless recovery... You have all heard these terms. The ACS Committee on Economic and Professional Affairs (CEPA) has an active task force on globalization issues including liaisons from Corporation Associates, Committee on International Activities, Committee on Science, Divisions of Professional Relations, Business Development and Management, Small Chemical Business, and other interested parties. It is engaged in many activities, such as reviewing pertinent news and literature, disseminating information, organizing symposia, carrying out globalization strategic planning, coordinating with other interested groups, and **(above all) soliciting member input**. To find out more, please visit the following web sites:

1. Task Force web page with a summary of activities:

<http://www.chemistry.org/portal/a/c/s/1/career.html?DOC=committees%5ccepa%5cglobal.html>

2. Bibliography of pertinent publications on globalization:

http://www.chemistry.org/portal/a/c/s/1/acdisplay.html?DOC=committees%5ccepa%5cglobal_bibliography.html

3. CEPA symposia and presentations related to globalization:

http://www.chemistry.org/portal/a/c/s/1/acdisplay.html?DOC=committees%5ccepa%5cglobal_workshops.html

4. Message Board (available soon). You are welcome to enter your opinions and comments on globalization issues here:

<http://www.websitetoolbox.com/tool/mb/cepa>

For more information, visit CEPA's home page:

<http://www.chemistry.org/portal/a/c/s/1/acdisplay.html?DOC=committees%5ccepa%5cindex.html>

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November 9th

Speaker Dr. Steven I. Dutch

Title A Scientist Goes to Desert Storm

Abstract When my army reserve unit was mobilized in December 1990, I got a fascinating, if somewhat unwelcome, opportunity to view one of the great environmental disasters of history close at hand. My unit, a Civil Affairs company, was tasked with aiding civilian recovery efforts in Kuwait and moved into Kuwait only 24 hours after the cease fire. From our compound only three kilometers north of the Maqwa Oil Field, we could see up to 100 burning wells. Although press coverage depicted Kuwait as smothered in total darkness, Kuwait City was actually smoke-free most of the time. Communities on the shore south of Kuwait City experienced much worse conditions of darkness. On at least one occasion, we experienced complete darkness from horizon to horizon at midday, during which it was literally impossible to tell whether it was noon or midnight. In addition to observing an environmental catastrophe, my experience in Kuwait gave me the chance to see first-hand some of the astonishing physical effects of modern munitions. After being redeployed to Saudi Arabia in April 1991, we were sent to Operation Provide Comfort, the effort to aid the Kurds in northern Iraq. This experience allowed me to view the spectacular geology of northern Iraq, near the boundary between the Arabian and Turkish plates, as well as to observe and photograph some remarkable arid-climate meteorological events.

Biographical

Sketch

Steven Dutch is a geologist who got his bachelor's degree (and a ringside seat for the unrest of the 1960s) from the University of California at Berkeley. He did his doctoral research at Columbia University, with a break for military service that included a year in Turkey. The subject of his thesis was the geology of the Sudbury, Ontario area, but in 1975, he also participated in a Columbia expedition to Antarctica. Since 1976, he has been at the University of Wisconsin at Green Bay, where he holds the rank of professor and teaches "hard rock" geology: mineralogy, petrology, structural geology, and plate tectonics. His principal research interests are the Precambrian geology of the Great Lakes region, the development of computer programs for earth science education, and the relationships between science and society, particularly as expressed in pseudoscience movements. He is the author of an earth science textbook. In 1982, Dr. Dutch resumed his military career by joining the 432nd Civil Affairs Battalion of the U.S. Army Reserve. He spent six months in the Persian Gulf and Kurdistan in 1991 and six months with the peacekeeping mission in Bosnia in 1996.

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