February 2016
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American Institute of Chemical Engineers
Knoxville-Oak Ridge Section

For additional information see our Web site at: http://www.ornl.gov/sci/aiche/
Or contact: Paul Taylor, taylorpa@ornl.gov, (865)574-1965 or
Amber Tipton, atipto11@utk.edu, 974-6458

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February 2016 Meeting – Joint with ANS

Date: Tuesday, February 9, 2016
Cost: $25
Location: Calhouns on the River, 400 Neyland Drive, Knoxville, TN 37902

5:00 pm Executive Committee Meeting (All members welcome)
5:30 pm Social/Networking (Cash Bar Available)
6:30 pm Dinner - Menu (Cash or Check - **NOTE**: There is no cost for the program or PDH Certificate)
7:00 pm Program – Dr. Costas Tsouris, Oak Ridge National Laboratory, *Uranium from Seawater*

Abstract – Recent studies have estimated that terrestrial uranium ores can sustain approximately 100 years of nuclear power generation at the current rate of consumption worldwide. Extraction of uranium from seawater has received global attention due to the high overall amount of uranium dissolved in seawater, estimated at over 1000× the amount in terrestrial uranium ores. The challenge comes from the low concentration of uranium in seawater at ~3.3 ppb, which requires processing large amounts of seawater. The most energy-effective approach of recovering uranium from seawater is through uranium-selective adsorbents deployed in seawater of sufficient flow currents for extended periods of time. The DOE Office of Nuclear Energy (NE), Fuel Cycle Research and Development Program, has established a Fuel Resources Program to focus on the development of uranium-selective adsorbents and investigate uranium recovery from seawater. The goal is to secure fuel for future nuclear energy production and put a price cap on the cost of uranium. This presentation will describe the DOE-NE Fuel Resources Program and highlight its accomplishments so far.

Bio – Costas Tsouris holds a joint appointment with the Oak Ridge National Laboratory and the Georgia Institute of Technology. He specializes in chemical processing and recently on:

- Separations for energy applications, such as separations processes focused on nuclear fuel production and reprocessing, including uranium recovery from seawater and separations of off-gas produced during nuclear fuel reprocessing
- Process intensification - process innovation of novel chemical processes focused on enhancing process efficiency by using electric, magnetic, and gravity fields and by combining unit operations such as mixing, reaction, separation, heat transfer, etc.
- Capacitive deionization, a desalination process based on the electrosorption of ions by nanostructured carbon materials.

Please make your reservations no later than noon on February 8, by contacting

Paul Taylor, taylorpa@ornl.gov, (865)574-1965 or
Amber Tipton, atipto11@utk.edu, 974-6458

Students are encouraged to attend and will be subsidized

UT Student Poster Presentation at February Meeting

University of Tennessee Chemical and Biomolecular Engineering PhD candidate, Tyler Cosby, will present a poster on his research, titled: *Proton Transport in Imidazoles: Unraveling the Role of Supramolecular Structure*, at the February meeting of the Knoxville-Oak Ridge Section of AIChE. You are invited to talk with Tyler about his work at 5:00-6:00 p.m. or after the program.

Abstract - In the past decade eutectic mixtures have received increased attention as potential materials to fill roles in numerous applications such as chemical separation processes, drug solubility, solar cell electrolytes, supercapacitors, chemical sensors, and solvents for chemical synthesis.[1-2] In order for this potential to be realized a better understanding of the relationship between chemical structure and mixture properties is needed. In this work, charge transport and structural dynamics in levulinic acid and 2-ethyl-4-methylimidazole mixtures are studied over wide temperature, concentration, and frequency ranges by broadband dielectric spectroscopy, differential scanning calorimetry, rheology, dynamic light scattering, and Fourier transform infrared spectrometry. The influence of levulinic acid on the ionic conductivity, viscosity, charge transport and structural relaxation rates present in pure 2-ethyl-4-methylimidazole provides a better understanding of the origin of the unique properties of imidazole + acid-based deep eutectic mixtures.[3,4]

References:

(1) Ruß, C.; König, B., Low Melting Mixtures in Organic Synthesis – An Alternative to Ionic Liquids? *Green Chemistry* **2012,** *14* (11), 13.
(2) Yasuda, T.; Watanabe, M., Protic Ionic Liquids: Fuel Cell Applications. *MRS Bulletin* **2013**, *38* (7), 6.
(3) Cosby, T.; Holt, A. P.; Griffin, P. J.; Wang, Y.; Sangoro, J. R., Proton Transport in Imidazoles: Unraveling the Role of Supramolecular Structure. *The Journal of Physical Chemistry Letters* **2015,** *6*(19), 3961-3965.
(4) Griffin, P. J.; Cosby, T.; Holt, A. P.; Benson, R. S.; Sangoro, J. R., Charge Transport and Structural Dynamics in Carboxylic-Acid-Based Deep Eutectic Mixtures. *The Journal of Physical Chemistry. B* **2014,** *118* (31), 9378-85.

Bio - Tyler is originally from Pulaski, TN. He graduated from Tennessee Technological University with a B.S. in Chemical Engineering in May 2013. He was active in the undergraduate AIChE and Omega Chi Epsilon (OXE) chapters. In the summer of 2012 and 2013 he was a part of the Technology Internship Program (TIP) at SABIC Innovative Plastics in Mount Vernon, IN where he worked in the bisphenol A technology lab. He joined Dr. Joshua Sangoro's Soft Materials Research group as a PhD student in the fall of 2013. His research is focused on the impact of intermolecular interactions, molecular structure, and nano-scale confinement on the dynamics and physicochemical properties of eutectic mixtures and ionic liquids. His poster is titled: *Proton Transport in Imidazoles: Unraveling the Role of Supramolecular Structure.*

National Engineers Week

National Engineers Week is February 21-27, 2016. Engineers Week highlights the benefits of an engineering profession, the contributions that engineers make to society, and provides a forum for:

- Celebrating how engineers make a difference in our world
- Increasing public dialogue about the need for engineers
- Bringing engineering to life for kids, educators, and parents

If you are interested in additional information on National Engineers Week, refer to the National Society of Professional Engineers website, at: http://www.nspe.org/resources/partners-and-state-societies/national-engineers-week.

Opportunities to Volunteer

If you would like to support your local section of AIChE, there are several opportunities for service. The section is currently seeking volunteers to chair and participate in the following activities:

Social Media Committee – The local section desires to establish a presence on various social media outlets, such as: Facebook™, Twitter™, Linkedin™, and YouTube™. The Knoxville-Oak Ridge Section is seeking volunteers to chair and participate on the Social Medial Committee. The committee chair will serve as the point of contact and work with the committee to establish and maintain a presence for the local section in various social media outlets. The Chair of this committee would be responsible for recruiting committee members, setting up social media outlets, establishing and managing content, and implementation of all social media activities for the section.

Young Professionals Committee – The local section desires to establish a Young Professional's Group to increase participation and interactions with young chemical engineers within the East Tennessee region. The Knoxville-Oak Ridge Section is seeking volunteers to chair and participate on the Young Professionals Committee. The committee will establish a Young Professional's Group within the local section. The Chair of this committee would be responsible for recruiting committee members, coordinating activities for the group, developing a budget for the committee, working with the Social Medial Committee to publicize group activities, planning of activities, and coordination with the local section.

Webmaster – A volunteer is needed to assume the responsibility for the maintenance and updating of the Knoxville-Oak Ridge Section website. The site is presently hosted by Oak Ridge National Laboratory. However, the National AIChE has offered to host local section websites and transfer currently stored content. A volunteer is needed to lead this effort and subsequently to maintain site.

Tennessee Science Bowl - Feb. 26-27 - Volunteers are needed to work during the DOE sponsored Tennessee Science Bowl at the Blount County Pellissippi State campus. Fifty-six teams from across Tennessee are expected to participate. More than 200 volunteers are needed to help conduct this year's competition. Information about volunteer opportunities can be accessed at http://www.orau.gov/sciencebowl/volunteers/index.html. As a volunteer, you will be helping advance STEM education for students from across Tennessee and giving back to your state and local communities. For more information, contact Jennifer Tyrell at Jennifer.Tyrell@orau.org.

Southern Appalachian Science and Engineering Fair – April 4-7 – The Knoxville-Oak Ridge Section awards two $75 prizes for the best chemical engineering related posters in the Junior and Senior Divisions. Anyone who would like to help should visit the SASEF website at https://ag.tennessee.edu/sasef/Pages/judges.aspx and register as a judge. If you want to help judge for the AIChE awards, register as a special judge. SASEF also needs judges for the category awards, such as biology, chemistry, engineering, physics, etc. Judging will occur the afternoon of April 5th. SASEF is the premier science and engineering competition for students in middle and high school in the 23-county service area of East Tennessee.

Call for EDP Reviewers for the AIChE Chem-E-Car Competition® - AIChE's annual Chem-E-Car Competition® engages college students in designing and constructing a car powered by a chemical energy source that will safely carry a specified load over a given distance and stop. The competition increases awareness of the chemical engineering discipline among the public, industry leaders, educators, and other students.

In addition to an onsite review, each student team is required to submit an engineering documentation package (EDP) in advance of the competition. The Chem-E-Car Competition® Committee is in need of volunteers to review at most 2 such packages; ensure they have been completed correctly, and that the safety rules of the competition have been followed. The total anticipated time estimate is 3 hours at the most. This is a great opportunity for those who are not able to make the competition in person due to travel restrictions to see the creativity displayed by the students in the competition. All of the EDP packages and instructions on how to review them are sent to volunteers electronically.

Online volunteers are sent a short copy of the safety rules, and would be reviewing the EDPs for compliance with safety rules and completeness. Volunteers are asked to provide general comments regarding the safety of the vehicle and the completeness of the package, which are passed along to the students who will have a chance to remedy any safety concerns before their car is judged onsite by a live safety inspector. A safety evaluation form will be provided to guide the review process.

EDP reviews will begin during the month of February, and over 120 EDPs are expected to be submitted for the 9 upcoming Regional Competitions in April 2016. If you are interested in helping AIChE conduct a safe Chem-E-Car program again this year, please send an email to Sarah Ewing at sarae@aiche.org. This competition could not exist without the help of volunteers, and this review process will help keep students and bystanders safe before, during and after the competition. If you are aware of anyone that might be also interested in assisting, please pass this email on to them.

Below are the locations for the upcoming 2016 Regional Chem-E-Car Competitions. On Site Volunteers are always welcome! Please email Sarah Ewing for more details at sarae@aiche.org.

April 1st Weekend: University of Alabama-Tuscaloosa, Kansas State University and University of Arizona
April 8th Weekend: University of Houston and University of Delaware
April 15th Weekend: Miami University of Ohio, University of California-Riverside and University of Washington
April 22nd Weekend: University of Massachusetts-Amherst

If you have an interest in any of these volunteer opportunities, please contact either one of the local section officers to express your interest or the indicted point of contacts above.

Comparison of the Knoxville – Oak Ridge Section with National AIChE Averages

National AIChE conducted a survey of the Local Sections in 2014 and again this year. The purpose was to help determine, and support, the health and stability of the Local Sections. Response was good, with 74% of the Local Sections submitting responses, compared to 71% last year. The results for our Local Section and national averages for 2015 are shown below. The results are very similar to last year.

"National feels that the Local Sections are instrumental for the success of AIChE as an organization because of their potential to exhibit the numerous benefits that come with being part of the Institute in a more frequent and personal way. Furthermore, the members of these sections can serve as a talent pool for crafting a new generation of leaders for our Institute."

"Because AIChE is positioning itself as a data-driven organization, its initiatives must be supported accordingly. With this in mind, a systematic and sustainable measurement of the health of the sections can help in identifying areas for supporting the Local Section executive boards in addition to measuring performance of initiatives and programs."

"Primarily, the health of LS depends on its ability to:

1. Remain organized at the board level.
2. Remain relevant to its members.
3. Remain financially stable.
4. Recruit new members.
5. Maintain healthy member involvement."

Question	Knoxville-Oak Ridge	National Average
Did the section hold officer elections in accordance with the LS's by-laws?	Yes	66% yes
Did your section file a local section annual report within the last two years?	Yes	90% yes
Does your section fill a treasurer's report according to the specific section requirements?	Yes	88% yes
Does the section operate and maintain an up-to-date webpage?	Yes	62% yes
Did the section publish a newsletter (physical or digital) periodically in the last year?	Yes	48% yes
Does the section actively maintain a social media presence for communications, advertising, event info etc.?	No	43% yes
Did the section attend the Local Section Leadership Workshop meeting within the last two years?	No	30% yes
Did the section conduct any activity with student chapters in its area within the last year?	Yes	68% yes
Does the section have a Young Professionals group?	No	27% yes
How many members have paid local dues?	82	45% < 50

Comparison of the Knoxville – Oak Ridge Section with National AIChE Averages (continued)

The Knoxville – Oak Ridge Section generally compares well with the national averages. We have a slightly larger than average membership and an active leadership structure. Two areas where we could potentially do more are in maintaining a social media presence and in having a young professional group within the Section. Addressing these areas will require having a volunteer, hopefully a young engineer, to work on them. If you are interested, please contact one of the Board members. The number of people who have paid local dues to the Section are slightly lower than last year, 82 vs. 90. The local dues mostly supports student activities, including free meals for students who attend our local meetings, support for local science fairs and competitions, and awards for individual students. If you have not paid your local dues, please consider doing so.

(Article courtesy of Paul Taylor, using information from 2015 LOCAL SECTION ANNUAL REPORT,
Authors: Rishon Benjamin[1], Daniel Sujo[1], Dilek Alkaya[2], Brian Daly[3], Monica Stowe[4],
(1)Delaware Valley Section, (2) Northern California Section,
(3) Local Section Committee, (4)AIChE Staff, January 2016.)

Knoxville – Oak Ridge Section Awarded Grant from National AIChE

The Knoxville-Oak Ridge Section was recently awarded a $200 grant from the National AIChE. The Speaker's Corner Grant is to be used to defray the costs for nationally recognized speakers from AIChE's Speaker's Corner. AIChE's Speaker's Corner is composed of leading experts and outstanding communicators who present keynote talks at AIChE Local Section meetings on a broad range of contemporary topics. The Knoxville-Oak Ridge Section recently hosted Dr. Pete Ludovice from the Speaker's Corner during the December 2015 meeting (http://web.ornl.gov/sci/aiche/calendar.html).

Paul Taylor Receives Shining Star Award


Paul Taylor

The Local Section's Treasurer, Paul Taylor, was recently honored by a Shining Star Award from the National AIChE. The Shining Star Award recognizes outstanding volunteerism at the AIChE local section level, encourages members to become more involved in local section activities, and values attributes, such as:

- Dedication and personal commitment to AIChE and the Local Section
- Willingness to take on a daunting task
- Eagerness to set an example for others
- Willingness to step up and help the section when it needed it the most
- A long history of service to the section Infusion of new ideas / energy into the section

Please extend your appreciation to Paul Taylor for his many years of volunteer service and congratulate him on the receipt of the Shining Star Award.

Activities Calendar

Date	Time	Topic	Speaker	Location
Feb 9	5:30 PM	Joint with ANS – Uranium from Seawater	Costas Tsouris	Calhouns on the River
Mar 17	5:00 PM	Joint meeting with UT – Urban Forestry Program	Kasey Krouse	UT Ag Campus
Apr 14	5:30 PM	Energy Choices and Consequences	Harold "Lee" Dobbs, UT	Rothchild's, Knoxville TN
Apr XX		UT Department of Chemical & Biomolecular Engineering Awards Banquet		TBD
May 12	5:30 PM	Super Hydrophobic Coatings	TBD	Rothchild's, Knoxville TN

Sponsoring Opportunities

We continue to accept advertising in the newsletter in order to provide funds to support student participation in the meetings.

Rates per newsletter are:

$80 full-page advertisement

$45 half-page advertisement

$25 quarter-page advertisement

The section will also continue to accept individual or corporate sponsors to provide student meals at section meetings. The sponsor will be recognized at the meeting and in the Newsletter.

The cost to sponsor one meeting is **$200**. It's a great way to encourage students to attend the local meetings and become future members in the Institute!

(Ferro fluid at Princeton Plasma Physics National - Source: DOE Digital photo archive at: https://www.flickr.com/photos/departmentofenergy/21633625025/in/photostream/)

"A team is not a bunch of people with job titles, but a congregation of individuals, each of whom has a role that is understood by other members."

R. Meredith Belbin
British researcher and management theorist
1926

Officers

Chair:	Mark Swientoniewski	574-1150	swientoniem1@cns.doe.gov
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See us at:

http://www.ornl.gov/sci/aiche/

Editor: B. Lewis

About Our Organization – AIChE Chemical Engineering Body of Knowledge

The AIChE Chemical Engineering Body of Knowledge (BOK) is a living document that serves as a resource for chemical engineers to determine what technical knowledge and proficiency is expected at any stage of their career. It will be updated periodically to maintain its currency.

This document has been in the making for more than a decade and was created by chemical engineers with a desire to address changing times and perceptions of the profession of Chemical Engineering.

The BOK covers the range of skills, knowledge, and abilities (KSA) required by the chemical engineering profession. The information in this document can be used for personal skills development, career planning, and to determine content and competency requirements for education and training programs. The document also includes a listing of knowledge and skills that a chemical engineer may possess, arranged in three categories: Affective, Cognitive, and Psychomotor.

The BOK assesses changing abilities throughout a career by defining 4 stages of career progression:

Stage 1 – Engineers with minimal experience (recent graduates) or one changing careers; having a collection of knowledge and skills with ability to apply with supervision.

Stage 2 – Engineers with minimal competence in relevant knowledge and skills that are functioning with some degree of independence. This level is required for professional licensure.

Stage 3 – Engineers with mature technical competence in relevant knowledge and skills with the addition of management skills (e.g., primarily supervisory and administrative duties).

Stage 4 – Engineers with expert technical competence in specific knowledge and skills that typically have only minimal supervisory and administrative duties. Others seek consultation with this engineer.

The BOK presents a series of 16 KSA matrixes that demonstrate the ability level for knowledge and skills at the four career stages that are cross referenced with industry or job roles. This document was developed under the direction of the AIChE Career and Education Operating Council with the purpose of:

- Identification of skills and knowledge required of a chemical engineer working as an engineering professional
- Guide the education effort of AIChE to keep chemical engineering professional current in their fields

(Article taken from AIChE website: http://www.aiche.org/resources/publications/body-knowledge)

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