



American Institute of Chemical Engineers

Knoxville-Oak Ridge Section

For additional information see our Web site at: <http://www.ornl.gov/sci/aiche/>

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November 2016 Meeting

Date: Thursday, November 10, 2016
Cost: \$20 (Cash or Check at the door - **NOTE:** There is no cost for the program or PDH Certificate)
Location: Rothchild Catering and Conference Center, 8807 Kingston Pike, Knoxville TN
5:00 pm Executive Committee Meeting (All members welcome)
5:30 pm Social/Networking
6:00 pm Dinner – Menu
7:00 pm Program – Dr. Saed Mirzadeh, Corporate Fellow, Oak Ridge National Laboratory, ***Production of Alpha-emitting Radionuclides for Cancer Therapy***

Abstract – Within the past five years, the investigation of targeted cancer therapy using α -emitters has developed considerably and recent clinical trials have generated promising results. In specific, the initial clinical trials for treatment of acute myeloid leukemia have demonstrated the effectiveness of the α -emitter ^{213}Bi in killing cancer cells. Recent pre-clinical studies have also shown the potential application of both ^{213}Bi , and the ^{225}Ac parent radionuclide in a variety of cancer systems and targeted radiotherapy. Bismuth-213 is obtained from a radionuclide generator system from decay of 10-d ^{225}Ac parent -- a member of the ^{229}Th chain. This presentation summarizes our experience in producing ^{225}Ac (parent of ^{213}Bi) in partial support of the on-going clinical trial. The initial purification of ^{229}Th from waste material began at ORNL in 1995, and since then the separation process has been refined and expanded to a current production level of ~760 mCi of ^{225}Ac in 2013. Initiatives to enhance the production of ^{225}Ac to meet the growing demand will be discussed in some details. These initiatives include both reactor and accelerator production of ^{229}Th , and direct production of ^{225}Ac via high energy proton spallation reaction on natural thorium metal targets.

Bio – Dr. Mirzadeh received a B.S. in chemistry from the National University of Iran and a Ph.D. in physical chemistry from the University of New Mexico. He began his career at ORNL in 1989 and is currently a distinguished staff scientist in the Nuclear Security and Isotope Technology Division at Oak Ridge National Laboratory, where he serves as the technical lead for the medical isotope research and production program. (continued page 2)

Please make your reservations by noon, November 8, by contacting
 Paul Taylor, taylorpa@ornl.gov, (865)574-1965 or
 Amber Tipton, atipto11@utk.edu, 974-6458

See page 2 for an alternate electronic registration option using EventBrite

The Section will subsidize up to 15 students, including graduate students

Alternate Registration and Payment Option for Local Section Meeting Attendees

The Knoxville-Oak Ridge Section of AIChE is providing an alternate registration and payment option to cover the costs of meals, speakers, and student attendees at our monthly meeting. Attendees now have the option to pay by credit card using an online payment system at the following web-address:

<https://www.eventbrite.com/e/medical-isotope-production-tickets-29016499130>

If you use this service, the cost for the meeting will be \$22.09. If you do not want to use this web-based payment option, you may continue to pay \$20 at the door by cash or check.

November 2016 Meeting (continued)

Dr. Mirzadeh is an internationally recognized leader in the research, production, and application of medical isotopes and a renowned authority in many aspects of targeted alpha therapy (TAT). His work in radiochemistry has been vital to perfecting chemical separations and purification for a variety of source radioisotope generators. Several of his patented radioisotope generators are the foundation for the production and purification of radioisotopes used in nuclear medicine applications. Mirzadeh also has worked and collaborates with a number of medical researchers in establishing protocols for radiolabeling of biological targeting molecules.

Dr. Mirzadeh's career is distinguished by his efforts in the research and production of ^{225}Ac . Once his research identified ^{225}Ac as an ideal radioisotope for TAT applications, he led the recovery and purification of ^{229}Th for use in the creation of ^{225}Ac . Because of this work, ORNL remains the largest source of highly purified ^{229}Th , and ^{225}Ac is now widely used in clinical trials and research. In addition,

Mirzadeh is collaborating on a project with colleagues at Brookhaven and Los Alamos National Laboratories to investigate a different method of producing ^{225}Ac through irradiation of thorium targets using linear proton accelerators. His current research is also focusing on the production ^{227}Ac for medical applications, and the potential use of nanoparticles for the delivery of radium and actinium isotopes for treatment of cancerous cells.

Dr. Mirzadeh holds 13 patents in the areas of radioisotope production for medical applications and is the author of 4 book chapters and more than 160 peer-reviewed publications. Dr. Mirzadeh has served on the publication committee of the American Chemical Society's Division of Nuclear Chemistry and Technology, has been a member of the editorial board of the *Journal of Applied Radiation and Isotopes*, and has won several awards, including a R&D 100 Award and the 2007 American Nuclear Society Seaborg Medal.

Throughout the course of his career at ORNL, Mirzadeh has mentored

more than 70 undergraduate, graduate, and postdoctoral students. His guidance has helped many of these young scientists develop into leaders within government, industry, and academia.

In 2016, Dr. Mirzadeh was named an ORNL corporate fellow, with following citation, "*For his innovation in the production and application of medical isotopes; for advancing the separation and purification of actinides and heavy elements; and for his leadership in the use of alpha emitters to save the lives of cancer patients*".

Election of Local Section Officers

In accordance with the Knoxville-Oak Ridge Section of the AIChE By-Laws (<http://web.ornl.gov/sci/aiche/bylaws.html>), officers and directors are to be elected every year. Officers serve a 1-year term whereas Directors serve for 2 years.

The local section is looking for members in good standing that may be interested in volunteering for any of the following positions.

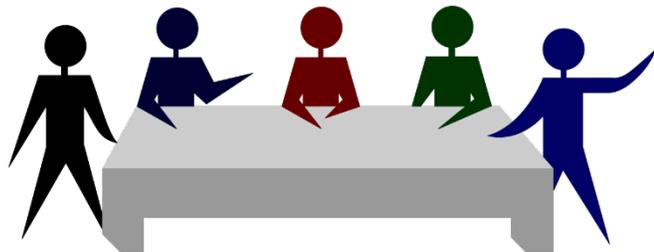
- Chair Elect (the previous Chair Elect automatically assumes the Chair position).
- Secretary
- Treasurer
- Directors (2)

We encourage anyone who would like to become more active in the local Section to run for an office. If you have questions about the level of commitment, job duties, or would like to include your name as a candidate for an office, please contact any of the Section officers at the email addresses and/or phone numbers posted at the end of the newsletter.

Once engaged in the Section meetings we are sure that you will agree that we have a great group of people who all work together to provide the Section with informative programs and opportunities. If you are unsure as to whether you can make all the meetings or cannot commit to being on the Board, we encourage you to still attend the Board meetings (typically beginning at 5:00, just before the scheduled Section meeting) and meet other members and share your ideas.

Board meetings are open to all members. Attending a board meeting is a good way to get a feel for the workings of the Section and to see firsthand the level of commitment and involvement required (actually very little) of the Section Officers. We routinely have several members participate in the board meetings although not an elected officer or director. If for no other reason, attending local Section meetings is a good way to network with other Chemical Engineers in the area.

(Reprint from, American Institute of Chemical Engineers, Knoxville-Oak Ridge Section, November 2015, Vol. 68, Issue 8)



UT Student Poster Presentation at November Meeting

University of Tennessee Chemical and Biomolecular Engineering graduate student, Uche Anozie, will present a poster on his work, *Nanoparticle-protein interactions and the effect of a high fat diet on nanoparticle biodistribution*, at the November meeting of the Knoxville-Oak Ridge Section of AIChE. You are invited to either arrive at 5:30 p.m. or remain after the regular meeting to talk with Uche about his work

Title: *Nanoparticle-protein interactions and the effect of a high fat diet on nanoparticle biodistribution*

Abstract: Nearly 70% of the U.S. adult population is overweight and about 30% are obese. Consequently, patients that will potentially be administered drug delivery vehicles (e.g. nanoparticles, filomicelles) to localize to tumors would have significant amounts of white adipose tissue (WAT), low-density lipoproteins, enlarged livers and other possible metabolic conditions like type 2 diabetes. Given that the vast majority of studies investigate the biodistribution and efficacy of drug delivery vehicles in lean mice with healthy metabolic states, our work was therefore aimed to examine nanoparticle-protein interactions in conjunction with the biodistribution of drug delivery vehicles as a function of mouse diet, weight and metabolic condition. The *in vitro* studies with plasma proteins and nanoparticles demonstrated that these proteins bind to nanoparticles differently depending on their surface chemistry. In the *in vivo* work, the uptake of nanoparticles in lean mice (C57) was mainly in the liver and spleen, and as the weight of these mice increased – through a high fat diet – the localization to these organs also increased. These results were also observed *in vitro* where

macrophages incubated with media containing increasing amounts of fatty acids exhibited increased nanoparticle internalization. In obesity models, *ob/ob* mice and *A^y* mice showed increased nanoparticle uptake in the liver while those with non-alcoholic fatty liver disease (NAFLD) – from a high fat diet over several weeks – showed a drop in nanoparticle uptake in contrast to lean, medium and heavy mice. From these observations, we postulate that the metabolic condition of a patient will significantly change the efficacy of current nanoparticle technologies.

Bio: Uche Anozie earned his BSc (2010) and MSc (2012) in Chemical Engineering from the University of Akron in Ohio. He worked as a chemical engineer for nine months in the pharmaceutical industry before moving to Knoxville to pursue a PhD in Chemical and Biomolecular Engineering at the University of Tennessee. He is currently working in Dr. Paul Dalhaimer's group where his research is focused on drug delivery systems with implications on metabolic states.



Uche Anozie



THE UNIVERSITY OF
TENNESSEE



VOLUNTEER'S CORNER

Engineers making a difference in our community

Date	Event
Anytime	<p>K-12 Outreach</p> <ul style="list-style-type: none"> • Teach Math or Science to a Middle/High Schooler? Junior Achievement, https://www.juniorachievement.org/web/ja-usa/home • AIChE Academy can deliver chemical engineering educational resources to help Chemical Engineering professionals connect, learn, and solve pressing challenges. Visit http://www.aiche.org/academy and see what AIChE Academy has to offer. <div data-bbox="792 800 1130 884" style="text-align: center;"> </div> <ul style="list-style-type: none"> • AIChE Young Professionals Committee. We sponsor a competition for our collegiate student chapters, the Global Undergraduate Student Video Competition. This competition requires chapters to create a video about a relevant chemical engineering subject that will be shown to high school students to teach them about that topic, and ultimately encourage them to study chemical engineering.
Anytime	<p>AIChE K-OR needs help with:</p> <ul style="list-style-type: none"> • Social Media Committee – The local section desires to establish a presence on various social media outlets, such as: Facebook™, Twitter™, LinkedIn™, and YouTube™. • 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. • Monthly Newsletter - Submit an Article, Editor-At-Large • AIChE K-OR Webmaster <p>Engineer's Without Borders – http://www.ewb-usa.org</p>
Date	Event
January February 17-18, 2017	<p>Tennessee Science Bowl See http://www.orau.gov/sciencebowl/volunteers/index.html for details.</p> <div data-bbox="889 1598 1086 1766" style="text-align: center;"> </div>
February 18, 2017	<p>Boy Scouts Merit Badge College – Roane State Community College - Merit Badge College</p>

	<ul style="list-style-type: none"> • Help teach the chemistry merit badge • Contact Paul Taylor or Mark Swientoniewski if you can help
February 19-25, 2017	Engineer's Week – DiscoverE.org
March 22 - 25 2017	TN FIRST Robotics See http://www.usfirst.org/community/volunteers
March 31, 2017 – April 1, 2017	AICHE UT Student Chapter is hosting the 2017 AICHE Southern Regional Student Conference
March	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.
March 27-30, 2017	Southern Appalachian Science & Engineering Fair (SASEF) – UTK Thompson Boling Arena To register as a judge: http://sasef.com/ . Select “Judges” and then “Register Online.”
May June	Volkswagen-Sponsored Camp Introduces Students to UT, Engineering With the Volkswagen-sponsored Engineering VOLunteers for Tenth Graders , or eVOL10, now under way at the University of Tennessee, Knoxville, College of Engineering , students in high school and middle school are getting a chance to take a deeper look into future possibilities in science, technology, engineering and mathematics, or STEM.
July	AICHE K-OR Planning Meeting for the upcoming academic year needs ideas and help planning speakers and arranging meeting locations.
August	
September	
October	
November	
December	

Starting on November 3 – AICHE national is launching [Volunteer Central](#), which allows members to search and apply for AICHE volunteer opportunities from anywhere in the world. To start receiving notifications about volunteer opportunities that are tailored to your interests and expertise, **visit** AICHE Engage at <https://engage.aiche.org> and fill out your volunteer profile. Once your volunteer profile is updated you will be notified when a volunteer opportunity fits you, with a link to the opportunity's application. Alternatively, you can search the full list of opportunities to see if one matches your interests.

One of the biggest benefits to being a part of an organization like AICHE is giving back to your community through your volunteer contributions and participation. We look forward to your continued involvement over the coming years.



UT AIChE Students to Host Regional Conference

The UT student chapter of the American Institute of Chemical Engineers (AIChE) will be hosting the 2017 AIChE Southern Regional Student Conference on campus from March 31 to April 1, 2017. AIChE's regional conference is an annual event that attracts the best and brightest undergraduate chemical engineering students from across the South. The event allows serious-minded students to come together to share their technical knowledge, meet with industry professionals, and compare notes on their university experiences and plans for the future. Highlights this year include the Regional Student Paper Competition and the Regional Chem-E-Car Competition. Winners advance to AIChE's national Annual Meeting where they will compete against eight other student regions for the top prize. Attendees will be invited to take part in local industry tours and the Future's Fair where industry professionals will interact with future chemical engineering graduates.

Student organizations across campus are energized about their upcoming projects. Many of them will be using the university-based crowdfunding platform [VOLstarter](#) to garner support. Alumni will hear more about VOLstarter during Big Orange Give, the online fundraising campaign for the Knoxville campus in November, but projects go live for funding beginning mid-October. AIChE is already accepting support to help host the conference.



AIChE students decorate *The Rock*.

The conference provides a chance for the university to showcase the talent, innovation, and collaboration of its scholars. If you should wish to support this endeavor and any of these student groups and their events, please see specific instructions as follows:

For questions or to support the 2017 AIChE Southern Regional Student Conference, contact Mary McBride 865-809-8636 or email aiche_src17@utk.edu.

For more about VOLstarter, navigate to volstarter.utk.edu.

(Excerpt from UT College of Engineering E-Newsletter at: <http://www.engr.utk.edu/edonews/coe-student-groups-gear-up-2016.html>)

Activities Calendar

Date	Time	Topic	Speaker	Location
Nov 10	6:00 PM	Production of Alpha-emitting Radionuclides for Cancer Therapy	Saed Mirzadeh, ORNL	Rothchild's, Knoxville TN
Nov 13-18		2016 AICHe Annual Meeting		San Francisco CA
Dec 1	6:00 PM	Joint meeting with SWE – Bee keeping	Howard Kerr	Rothchild's, Knoxville TN
Jan 19	6:00 PM	Quality Assurance of TVA's Landfills	Nick McClung	Rothchild's, Knoxville TN
Feb 21	6:00 PM	Joint meeting with ANS – Tennessine (element 117) Discovery	Jim Roberto, ORNL	Calhoun's, Oak Ridge TN
Mar 23	6:00 PM	Joint meeting with UT Student Chapter – Unit Operations Lab Tour	TBD	UT – Dougherty
Apr 18	6:00 PM	A Peripatetic Life – The Life of an Engineer	Emory Ford, Emeritus Director of MTI	Rothchild's, Knoxville TN
Apr 20		UT Department of Chemical & Biomolecular Engineering Awards Banquet		TBD
May 16	6:00 PM	Finances	Jim Brogan, Brogan Financial	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!



(Refueling of High Flux Isotope Reactor at Oak Ridge National Laboratory- Courtesy of DOE Digital Photo Archive, (<https://www.flickr.com/photos/oakridgelab/19944787756/>))

"Never let the urgent crowd out the important"

Officers

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Kelly Catlin Walker
American professional racing cyclist
1995

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We're on the Web!

See us at:

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

Editor: B. Lewis

About Our Organization... Industry Technology Groups

AIChE Industry Technology Groups allow industry, academia and government representatives to collaborate and leverage resources for research, technology transfer and other activities. They organizations such as the following:

Center for Chemical Process Safety (CCPS)

CCPS is a not-for-profit, corporate membership organization within AIChE that identifies and addresses process safety needs within the chemical, pharmaceutical, and petroleum industries.

Society for Biological Engineering (SBE)

(SBE is an AIChE Industrial Technology Group, is a global organization of leading engineers and scientists dedicated to advancing the integration of biology with engineering.

Institute for Sustainability (IfS)

IfS is an AIChE Industrial Technology Group that provides multidisciplinary scientific and technical rigor to sustainability discussions and encourages the incorporation

of sustainability concepts in engineering education.

Center for Energy Initiatives (CEI)

CEI is devoted to the development, design and efficient use of energy by chemical engineers and related professionals.

Safety and Chemical Engineering Education (SACHE)

SACHE was initiated in 1992 and is a cooperative effort between the CCPS and engineering schools to provide teaching materials and programs that bring elements of process safety into the education of undergraduate and graduate students studying chemical and biochemical. Products and processes.

Design Institute for Emergency Relief Systems (DIERS)

Formed in 1976, DIERS is an AIChE Technology Group and a consortium of 29 companies that develop methods for the design of emergency relief systems to handle runaway reactions.

Design Institute for Physical Properties (DIPPR)

(DIPPR is a source of critically evaluated thermophysical and environmental property data.

International Society for Water Solutions (ISWS)

ISWS is focused on pressing issues of water access, quality, sustainability, and security.

International Metabolic Engineering Society (IMES)

IMES seeks to promote and advance metabolic engineering as an enabling science for bio-based production of materials, pharmaceuticals, food ingredients, chemicals and fuels.

(Source: <http://www.aiche.org/community/itg>)

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