TEXAS MATERIALS INSTITUTE

Materials Science & Engineering

THE UNIVERSITY OF TEXAS AT AUSTIN

Texas Materials Institute

Materials Science and Engineering Program

NEWS BULLETIN

Fall 2016

In this issue:

The University of Texas at Austin

WHAT STARTS HERE CHANGES THE WORLD

Greetings from the Director

After a busy and productive year, we are delighted to share our 2015-2016 Texas Materials Institute (TMI): Materials Sciences & Engineering Program Newsletter with you. Our program had an extremely eventful year, with many of our top tier graduate students moving on to reputable positions in the materials industry, national laboratories, or academia. Additionally, our recruiting effort this year brings an exceptional incoming class that we know will further the TMI mission of producing a top-notch workforce through our MSE Graduate Program. We take immense pride in our students' academic achievements and outstanding efforts in the university community, and they are therefore detailed within these pages.

Our materials characterization facilities had numerous upgrades and improvements this past year, including the modernization of our X-ray scattering facility and the incorporation of air-sensitive sample transfer chambers with our surface analysis facilities: X-ray photoelectron spectrometer (XPS) and time-of-flight – secondary ion mass spectrometer (TOF-SIMS). As an example, we feature the XPS capability on page 6. We are proud to provide the necessary modern instrumentation for our students and faculty to conduct cutting-edge materials research.

Our faculty and students accrued an array of awards and recognitions this year, including Dr. Deji Akinwande's 2016 Presidential Early Career Award for Scientists and Engineers. Dr. Akinwande received his award from President Obama at the White House in February. The numerous awards and recognitions listed in this newsletter are a reflection of our outstanding faculty and students.

It is heart-breaking to say that our MS&E Program also experienced a tragedy this year as one of our star students passed away in May. Federico Cardenas of the Ferreira Research Group was a shining example of what graduate students strive to be: bright, hard-working, and unfailingly kind to everyone around him. We send our thoughts and prayers to his family and friends at this difficult time.

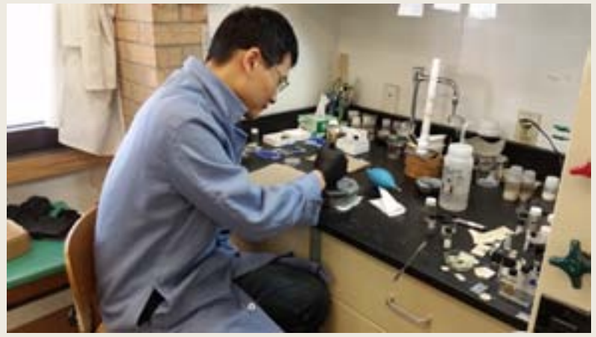
Finally, we would like to extend our warm congratulations and gratitude to Dr. Llewelyn Rabenberg, a mechanical engineering faculty member, who retired this year after an impressive tenure spanning 27 years at The University of Texas at Austin. We appreciate his immense contributions to our MS&E Program through materials education and research, and we wish him the very best in his retirement.

Sincerely,

Arumugam Manthiram, Ph.D.
Director, Texas Materials Institute

TMI: Materials Science & Engineering

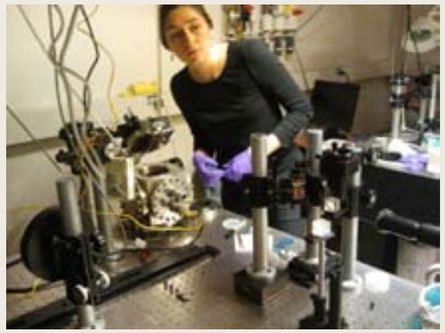
Around the TMI Labs



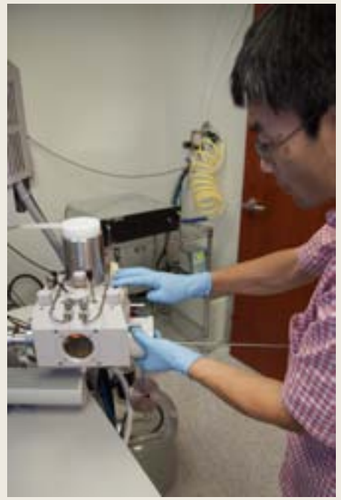
MS&E graduate student Ke-Yu Lai mixes chemicals in a mortar to make gels for fuel cells

MS&E Graduate student Karl Kreder and Dr. Manthiram assessing lithium-ion battery tests

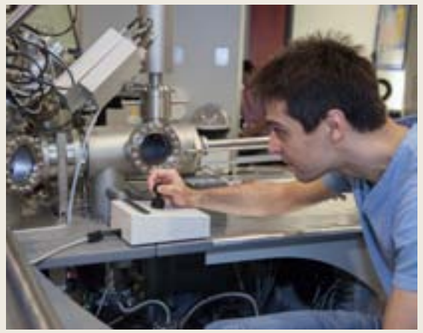
Dr. Karalee Jarvis and the JEOL 2010F Transmission Electron Microscope (TEM)



MS&E Graduate student Laura Spinella checks her wafer curvature system



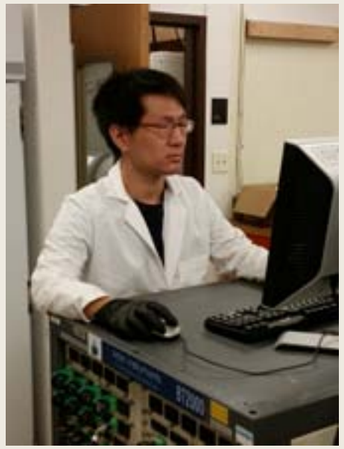
Dr. Shouliang Zhang and the Quanta SEM



Dr. Andrei Dolocan and the Time of Flight Secondary Ion Mass Spectrometer (TOF SIMS)

MS&E Graduate Student Szu-Tung Hu in the Surface Analysis Laboratory

Dr. Richard Piner measuring the composition of a sample with the Oxford EDS system on the FEI Quanta 600 SEM



MS&E graduate student Ho Hyun Sun checks his cells for electrochemical performance

This Year at TMI

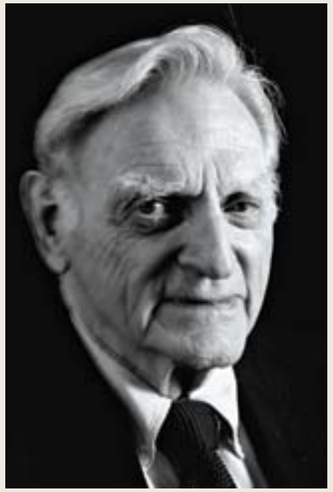
SEPTEMBER 2015

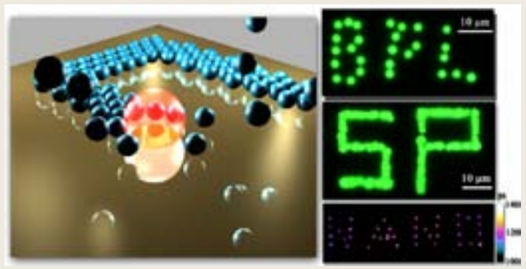
The MS&E Program is proud to announce that Jianhe Guo of the Fan Research Group received a highly competitive fellowship from the Howard Hughes Medical Institute for international students in doctoral programs. The fellowships were awarded to 45 different students from 18 different countries in an effort to help them complete their graduate degrees in life science related research. Jianhe is conducting research developing materials for biomedical delivery applications. The awardees will receive $43,000 during each year of the fellowship.

OCTOBER 2015

Israel's Prime Minister Benjamin Netanyahu and Israel's Science, Technology and Space Minister Yaakov Peri presented Professor John B. Goodenough, inventor of the lithium-ion battery cathode materials, The Eric and Sheila Samson Prime Minister's Prize for Innovation in Alternative Fuels for Transportation. The Samson Prize, totaling $1 million, is the world's largest monetary prize awarded in the field of alternative fuels and is granted to scientists who have made critical advancements. The selection committee called Dr. Goodenough a "pioneer" in the research of rechargeable lithium-ion batteries. Batteries incorporating Goodenough's cathode materials are used worldwide for mobile phones, power tools, laptop and tablet computers, wireless devices, as well as electric and hybrid vehicles.

Goodenough plans to donate his share of the prize money to UT Austin to thank the university for helping to support his research lab over the years.





JANUARY 2016

A reasearch team in the Cockrell School of Engineering led by MS&E assistant professor Yuebing Zheng, has solved how to quickly, gently, and precisely handle tiny particles to allow researchers to more easily build tiny machines, biomedical sensors, optical computers, solar panels, and other devices. Using microbubbles to gently transport the particles, this bubble-pen lithography technique can quickly arrange particles in various shapes, sizes, compositions, and distances between nanostructures. The team, which also includes MS&E associate professor Deji Akinwande, described their patented device and technique in a paper published in the Jan.13 issue of Nano Letters.

FEBRUARY 2016

Dr. Arumugam Manthiram was awarded the status of Fellow of the Royal Society of Chemistry, an honor bestowed upon those providing a distinguished service in the field of chemistry. Achieving Fellow status in the chemical profession denotes to the wider community a high level of accomplishment as a professional chemist. In addition, fellows must have made an outstanding contribution to the advancement of the chemical sciences; or to the advancement of the chemical sciences as a profession; or have been distinguished in the management of a chemical services organization.

FEBRUARY 2016

MS&E Faculty member Dr. Deji Akinwande was honored with the Presidential Early Career Award for Scientists and Engineers (PECASE) by President Obama. The award is the highest honor bestowed by the US Government on science and engineering professionals in the early stages of their careers. "These early career scientists are leading the way in our efforts to confront and understand challenges from climate change to our health and wellness," President Obama said. "We congratulate these accomplished individuals and encourage them to continue to serve as an example of the incedible promise and ingenuity of the American people."

Dr. Akinwande and his research group conduct basic and applied research on the frontier of nano materials, flexible nano-electronics, bioelectronics, RF integrated circuits, and electromagnetics. His passion lies in the discovery and application of new paradigms to enable novel ubiquitous systems that address social needs.

FEBRUARY 2016

MS&E faculty member, Dr. Guihua Yu, has been awarded one of the 2016 Sloan Research Fellowships for outstanding US researchers. The fellowships honor early-career scientists and scholars whose achievements and potential identify them as rising stars and the next generation of scientific leaders. Fellows are chosen based on nominations by their fellow scientists and winning fellows are selected by an independent panel of senior scholars based on the candidate's independent research accomplishments, creativity, and potential to become a leader in his or her field.

MARCH 2016

Dr. Arumugam Manthiram was also elected to the 2016 Class of MRS Fellows for pioneering contributions to fundamental understanding and development of materials for energy conversion and storage, novel chemical syntheses, student education and training, and leadership. The title of MRS Fellow honors those MRS members who are notable for their distinguished research accomplishments and their outstanding contributions to the advancement of materials research world-wide.

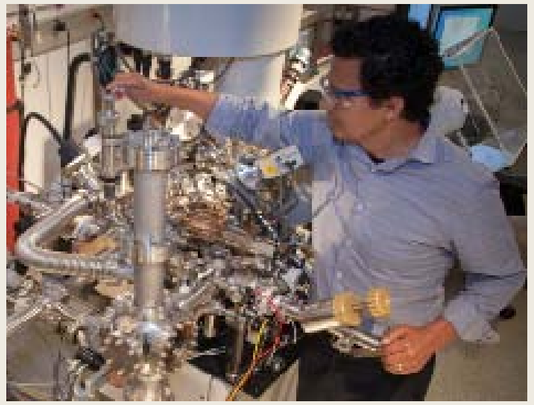
JULY 2016

MS&E faculty member Dr. Li Shi has been selected as a principal investigator by the Department of Defense to lead a Multidisciplinary University Research Initiative (MURI) project. Dr. Shi will receive a grant of $7.5 million to identify new materials that possess ultrahigh phonon thermal conductivity using advanced computational tools, while concurrently developing the materials growth techniques needed to synthesize them, as well as new measurements to experimentally validate and probe the materials' properties. Dr. Shi will work on the project with five partnering institutions, including the Massachusetts Institute of Technology, Boston College, the University of Illinois at Urbana-Champaign, the University of Houston, and the University of California, Los Angeles.

JULY 2016

The Department of Energy has selected Battery500, a national consortium led by Pacific Northwest National Laboratory, including Dr. Arumugam Manthiram of The University of Texas at Austin as its chief scientist, to help lead a new five-year, $50 million initiative to advance battery technology in electric cars. The Battery500 consortium includes leaders from four DOE national labs and 5 universities, all of which are working together to make smaller, lighter and less expensive batteries that can be adopted by manufacturers. In addition to Manthiram, professor John Goodenough, inventor of the lithium-ion battery cathode materials, will contribute his knowledge and expertise to the consortium.

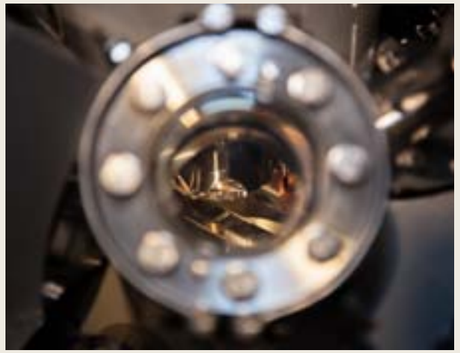
TMI Facilities Feature: Kratos XPS



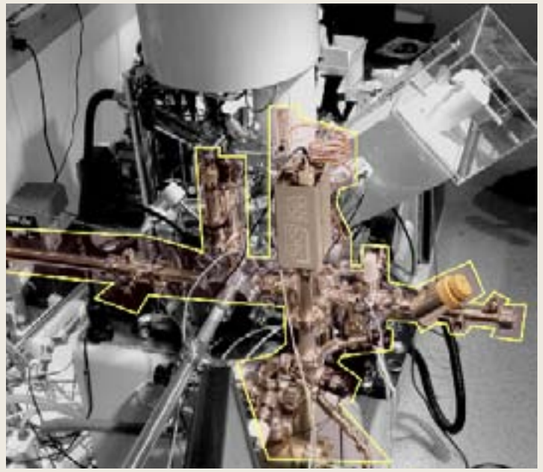
TMI Facility Manager Dr. Hugo Celio and the Kratos XPS (Figure 1)

In the Surface Analysis Laboratory at TMI, the Axis Ultra DLD instrument (manufactured by Kratos Analytical, Inc.) is fully equipped with a high sensitivity multi-technique photoelectron and ion spectrometer capable of surface mapping to provide lateral distribution maps for elemental and chemical species at the surface. The Axis Ultra incorporates monochromated aluminum X-rays as the primary excitation source for X-ray photoelectron spectroscopy (XPS) and He (I) source for ultraviolet photoelectron spectroscopy (UPS). In general, photoelectron spectroscopy probes the electronic structure of core and valence bands at the surface through analysis of the energy spectra of secondary electron emitted from the sample. XPS is a powerful surface analytical technique that provides accurate quantitative stoichiometric ratios and chemical state information on the outermost layers of materials at a scale of 10 nm.

In addition, the Axis Ultra DLD instrument is equipped with low-energy noble gas ion scattering spectroscopy (LEISS) to analyze the composition of atoms at the top layer of a surface. Like a scanning electron microscope (but with lower lateral resolution), the Axis ultra also provides real time parallel imaging to create elemental maps, without interference from the bulk of the material of the surface. The focus is on the X-ray photoelectron spectroscopy since this technique is the workhorse for many of the research groups that used this facility to analyze the elemental and chemical composition of air-sensitive composite materials, e.g., battery and photovoltaic materials and semiconductor nanoparticles.



Glass view port of the sample analysis chamber of the Kratos XPS (Figure 2)



The Axis Ultra DLD Instrument by Kratos Analytical, Inc. (Figure 3)

TMI research staff assists graduate students and postdoctoral fellows to transfer air sensitive materials from argon-filled glove boxes (with trace amounts of O_2 and H_2O) to an ultra high vacuum (UHV) chamber that houses the Axis Ultra XPS. The UHV chamber is also equipped with a unique interface for pressure-to-vacuum environmental sample transfer (IP-VEST). This interface was designed and developed at the Texas Materials Institute (U.S. Patent Application Serial No. 14/445,650 filed July 29, 2014). Outlined in yellow in Figure 3, the IP-VEST is permanently coupled at the back end of the UHV chamber, less than one meter from the XPS. By combining the Axis Ultra XPS and the IP-VEST, the Surface Analysis Laboratory offers an unparalleled innovation to safely and reliably transfer air-sensitive composite materials. In brief, IP-VEST is equipped with a differentially pumped load lock, a buffer chamber, a detachable capsule (which is used to transport samples from the glove box to the IP-VEST/XPS system), pump UHV chamber, seven pneumatic valves, and three pressure gauges. These components are used in a concerted format to assist with the transition of air-sensitive materials from a high argon pressure environment to a high vacuum regime, which has a similar vacuum level as the XPS UHV chamber. During this pressure transition, IP-VEST has a built-in method to generate a set of figures of merit that are based on the pressure changes as a function of time. As shown in Figure 4, this pump down curve, along with a reference argon pump down curve, is compared to ensure that the glove box and IP-VEST are working to their specifications. Current users of this interface are spread across various departments at UT Austin as well as other universities. IP-VEST has been cited in over fifteen publications.

In a recent study that decisively benefited from using the IP-VEST to transfer an air sensitive cathode material for an electronic structure analysis, Dr. Preetam Singh, a postdoctoral fellow and a member of the Texas Materials Institute team led by Professor John B. Goodenough, studied the mineral eldfellite ($NaFe(SO_4)_2$) as a potential Na-ion cathode material [1]. This naturally occurring material, named after its Icelandic place of origin, the Eldfell volcano, is comprised of Na^+ and Fe^{3+} layers separated at a fixed distance by SO_4^{2-} polyhedral. These fixed spaces allow the diffusion of sodium ions, i.e., the material is capable of realizing 80% of its theoretical maximum specific capacity, 99 mAh/g. The team reported the performance of $NaFe(SO_4)_2$ as hosting a reversible redox reaction of iron, Fe^{3+} Fe^{2+}, during the insertion of Na^+ ions when eldfellite is working as a cathode. Using the Axis Ultra XPS/IP-VEST, the team unambiguously showed the electronic structure of this redox process, (see Figure 5). Since Fe (2p) spectra are accompanied by broad satellite peaks, the Fe (3p) spectra were also recorded; they generally appear as sharp characteristic peaks with low intensities. Fig. 5(a) and (c) show, respectively, the Fe (2p) and Fe (3p) spectra; they show the presence of iron mostly as Fe^{3+}, which is air stable, before discharge in the as-prepared electrode material. Fig. 5 (b) and (d), respectively, show the Fe (2p) and Fe (3p) spectra; the data clearly show 90% of the iron in the Fe^{2+} state, which is highly unable in air but was safely transferred with IP-VEST, in the material discharged to 2 volts. Eldfellite may offer a low-cost rechargeable Na-ion electrode for batteries.

A highly versatile tool, the Kratos XPS is constantly proving its value for the on- and off-campus academic community. Industrial users interested in using the equipment are welcomed and may schedule time on the Kratos XPS using the link below.

[1] Preetam Singh, Konda Shiva, Hugo Celio and John B. Goodenough, Energy Environ. Sci., 2015, 8, 3000-3005

Figure 4

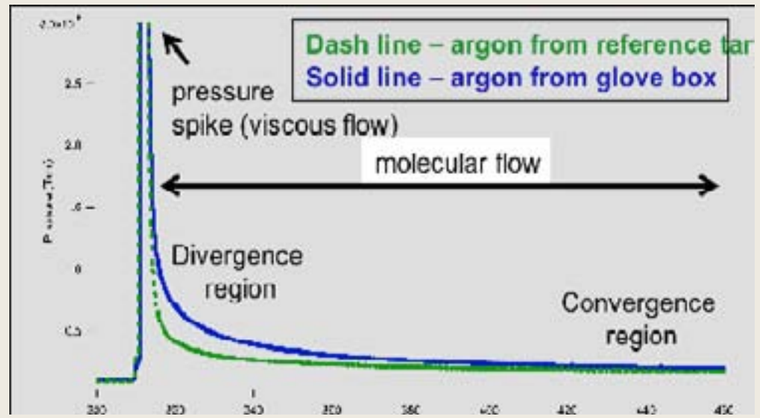
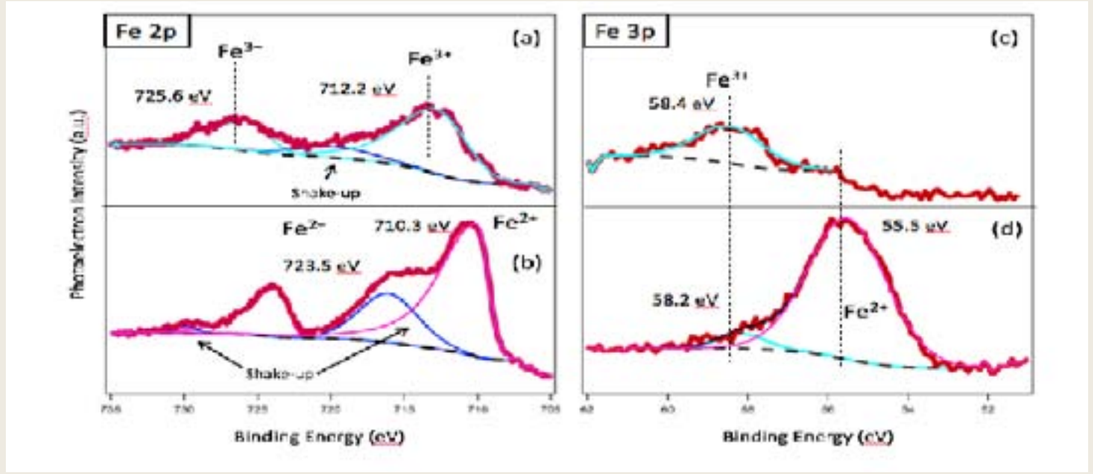


Figure 5



To reserve TMI equipment please visit our facilities page here: http://tmi.utexas.edu/core-facilities/

TMI Faculty Spotlight

Dr. Eric Taleff

Professor

Charlotte Maer Patton Centennial Fellow in Engineering

Eric M. Taleff is a Professor in the Department of Mechanical Engineering and a member of the Materials Science and Engineering Program. Prof. Taleff is a fellow of ASM International, and has received the Brimacombe medal of the Minerals Metals & Materials Society (TMS) as well as the Champion H. Mathewson Award from AIME/TMS. He was also named a Most Valuable Colleague for the John M. Campbell Award from General Motors. Prof. Taleff served his profession as the Program Director for the Metals and Metallic Nanostructures Program in the Division of Materials Research at the National Science Foundation from 2012 until 2013. He continues to serve his profession as an active volunteer in the TMS professional society.

Prof. Taleff's research and teaching interests are focused on the relationships between processing, microstructure, and the mechanical properties of structural materials. Structural materials are those intended to bear load in applications that can range from bridges and buildings to automobiles and aircraft. His group actively pursues research in a number of metal systems. These include light alloys based on aluminum, magnesium and titanium that are of particular interest for vehicle applications. Other systems currently under investigation are steels, nickel-based superalloys, and refractory metals, including molybdenum, tantalum, and tungsten. His research group probes fundamental questions in the field of metal science while also addressing technological problems of immediate interest to industry. Prof. Taleff believes that the University has a unique role in not only evolving new science, but in using science to build new engineering tools and methods that can be put into practice to benefit humankind. To this end, his group works directly with several partners from the manufacturing industries. An example of basic science discovered in Prof. Taleff's laboratory is the phenomenon of dynamic abnormal grain growth, which his group recently used to grow large single crystals of refractory metals in the solid state. An engineering topic of longstanding interest in his group is the warm and hot forming of light alloys, as in the superplastic and quick-plastic forming processes. Such processes are important to using light alloys for reducing vehicle weight. His group's contributions in this area have been directly used by industry to optimize and improve commercial forming operations. In addition to actively conducting research in these areas, Prof. Taleff teaches several courses on these topics to prepare our students for future professional contributions to the field.

Dr. Nanshu Lu

Assistant Professor

Dr. Lu is an assistant professor in the Department of Aerospace Engineering and Engineering Mechanics, the Department of Biomedical Engineering, and the Texas Materials Institute. She is now leading a multidisciplinary research group of ten graduate students and postdocs to explore the mechanics, manufacture, and bio-integration of soft and stretchable electronics. While our body is soft, curvilinear and dynamic, wafer based electronics are intrinsically hard, planar, and rigid. Through innovations in mechanics models, structural designs, and manufacturing processes, she can now flex and stretch silicon and metal just like temporary transfer tattoos and further integrate them intimately with the human body for continuous physiological monitoring, on-demand drug delivery, tissue engineering, or as soft surgical tools or implantable devices. Her representative work includes epidermal electronics and their low-cost manufacture and novel applications, enhanced stretchability and bendability of soft electronics, and mechanics at bio-electronics interface.

Dr. Lu has published more than 50 peer-reviewed journal articles, many of which have appeared in high-impact journals such as Science, Science Translational Medicine, Nature Nanotechnology, Nature Photonics, Advance Materials, Nano Letters, and ACS Nano. She has presented more than 40 invited talks at major conferences including the National Academy of Engineering Frontier of Engineering (NAS FoE) symposium, The Academy of Medicine, Engineering and Science of Texas (TAMEST) annual conference, Materials Research Society (MRS) meetings, ASME International Mechanical Engineering Conference & Exposition (IMECE), International Union of Theoretical and Applied Mechanics (IUTAM) Symposium, SPIE conferences, Society of Engineering Science (SES) technical meetings, and peer institutes. Her research has been highlighted by news media such as Nature News, Science Online, NSF Science360 News, MIT Technology Review, CNN News, BBC News, NPR, and Smithsonian. She has been honored with the NSF CAREER award, the Air Force Office of Scientific Research (AFOSR) and Office of Naval Research (ONR) Young Investigator Programs, the MIT's Technology Review 35 under 35 award, the 3M Nontenured Faculty Award, and the Netexplo Grand Prix.

Dr. Lu has been very active in serving the community. She is the founding Associate Editor of the new journal Soft Robotics (IF=6.13 first available in 2016) and the chair of the ASME Applied Mechanics Division "Integrated Structures" Technical committee since 2012. Additionally, she has organized numerous symposia at international conferences.

TMI Student Spotlight

Pauline Han, Ph.D. Student, Manthiram Research Group

Pauline Han is a Ph.D. student in the Manthiram research group. Her research interest focuses on clean energy materials with an emphasis on lithium batteries and more specifically, lithium-sulfur electrode architectures. Under the lithium-sulfur batteries umbrella, she hopes to improve both the cycle stability and the safety of these higher-energy density batteries and move them towards commercialization.

In addition to laboratory research, Pauline's interests include outreach projects for the community from the preschool all the way up to the university level. These outreach projects focus on facilitating discussions in various renewable energy materials and clean energy technologies. Pauline has previously worked with SciBridge, a Materials Research Society funded project, to develop and ship aluminum-air battery science kits to East African universities for their use in both science lectures and laboratories. Pauline is also actively involved as the president of The Electrochemistry Society Student Chapter (ECS) at UT Austin. The chapter encourages electrochemistry and renewable energy dialogue with other research groups and departments at UT by regularly hosting student seminars. ECS also provides the opportunity to its members to encourage scientific outreach at UT and with the surrounding Texas community. Thus far, the ECS student chapter has developed several multi-level science experiments to annually share with students in grades K-12 at exhibition events such as The Meridian School Science Day, Girl's Day, and Explore UT at UT Austin. Demonstrations range from marshmallow crystal structures to redox reactions, and include an introduction to fuel cell cars.

This summer, Pauline was given the opportunity to mentor a small group of high school students across Austin and it's surrounding areas that were interested in learning more about research career's in nanotechnology. This program was organized by the NASCENT (Nano-manufacturing systems for mobile computing and mobile energy technologies) center at UT Austin. There, she helped high-school students tackle research literature in different areas of nanotechnology and helped them to develop ideas and think critically in order to solve their own nano-related research problems. Pauline also works with the NASCENT center throughout the academic year hosting high-school students at the microelectronics center (MER) at UT for science and technology demonstrations and laboratory clean room tours. She hopes to continue to inspire both the community and young scientists to have an interest in clean energy technology and engineering through outreach projects as she continues her Ph.D.!

Jianhe Guo, Ph.D. Student, Fan Research Group

Jianhe Guo began his Ph.D. studies in the Materials Science & Engineering Program in the Fall of 2012. Under the supervision of Dr. Donglei Fan, his research involves investigating innovative mechanisms towards the design, synthesis, assembly and manipulation of nanoentities for micro/nano electromechanical systems (MEMS/NEMS) devices and their biomedical delivery and sensing applications. MEMS/NEMS devices are emerging as the next-generation technology that can significantly impact people's lives because of the great potentials of making technical breakthroughs in various areas including nanorobotics and biomedical applications. In particular, Jianhe is interested in rotary nanomotors, a core component of MEMS/NEMS that can convert diverse input sources into mechanical rotary motions for biomedical delivery, mechanical stimulation of live cells, and integration of microfluidic platforms and other nano robotic devices.

Although various approaches have been explored to build different types of rotary nanomotors, the applications of these rotary nanomotors are still greatly hindered by several difficulties: arduous and complex fabrication processes, high costs, low yield, and short lifetime. To address the aforementioned challenges, Jianhe and his co-workers develop an innovative type of nanomotors assembled from nanoscale building blocks. All characteristic dimensions of the nanomotors are less than 1 μm, at least 10 times smaller than that of the state-of-the-art micromotors fabricated through the top-down approach. This work was named as the #3 discovery "that will shape the world" by BBC Focus magazine in its 2014 list.

A facile large-scale bottom-up synthesis method for building blocks of the nanomotors was invented to allow mass production. By studying the tribology issues and rotation dynamics in this system, Jianhe keeps breaking the lifetime record of the rotary nanomotors of similar dimensions, which has reached to 80 hours and over 1.1 million rotation cycles in total. The capacity of mass production and the ultra-durable high performance greatly promote these nanomotors toward practical applications. And now, with the support of the HHMI International Student Research Fellowship, Jianhe is working on developing an advanced platform based on the nanomotor that will open an array of unprecedented opportunities in biomedical research and applications. Specifically, he hopes to realize the delivery, tuning and real-time detection of biomolecule release to designated live cells by the nanomotors in order to study various biological problems. He wishes to continue his research work in the interdisciplinary area of nanotechnology, health science, and biomedical engineering in the future.

Faculty Awards

Akinwande, Deji
- 2016 Presidential Early Career Award for Scientists and Engineers (PECASE)

Alu, Andrea
- Simons Foundation Investigator in Physics
- Edith and Peter O'Donnell Award in Engineering, The Texas Academy of Medicine, Engineering, & Science
- Inaugural ACS Photonics Young Investigator Award Lectureship, American Chemical Society

Crooks, Richard
- Faraday Medal of the Royal Society of Chemistry

Cullinan, Michael
- 2016 Outstanding Young Manufacturing Engineer Award, Society of Manufacturing Engineers

Freeman, Benny
- Fulbright Distinguished Chair

Goodenough, John
- The Samson Prize for Innovation in Alternative Fuels for Transportation
- Electrochemical Society Fellow
- Thomson Reuters Citation Laureate

Kovar, Desiderio
- Mechanical Engineering Department Award for Teaching Excellence
- Lockheed Martin Aeronautics Company Award for Excellence in Engineering Teaching

Lai, Keji
- 2016 Presidential Early Career Award for Scientists and Engineers (PECASE)

Liechti, Kenneth
- 3M Award for Excellence in Adhesion Science

Manthiram, Arumugam
- Royal Society of Chemistry Fellow
- Materials Research Society Fellow
- Billy & Claude R. Hocott Distinghuised Centennial Engineering Research Award

Miliron, Delia
- Sloan Research Fellowship, Chemistry

Milner, Thomas
- National Academy of Inventors

Peppas, Nicholas
- International Research Award, Biomaterials Society

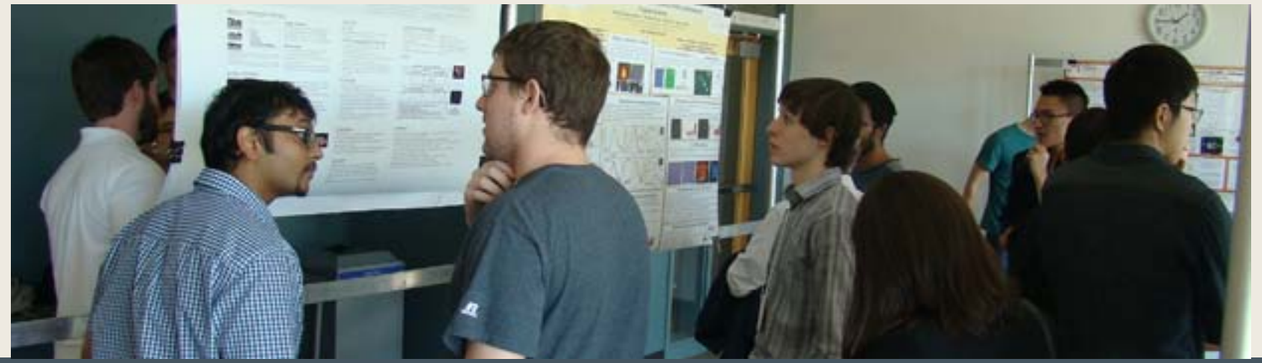
Ravi-Chandar, Krishnaswa
- Drucker Medal from the American Society of Mechanical Engineers

Rose, Michael
- 2016 Cottrell Scholar Award
- Teaching Excellence Award, College of Natural Sciences

Shi, Li
- Multidisciplinary University Research Initiative (MURI) Grant

Truskett, Thomas
- American Physical Society Fellow

Yu, Guihua
- Sloan Research Fellowship, Chemistry
- Royal Society of Chemistry Emerging Investigator Lectureship Award



Student Awards

Bharath Bangalore-Rajeeva (Zheng Research Group)
- Professional Development Award, The Graduate School

Tushar Chitrakar (Kovar Research Group)
- Harris L. Marcus Graduate Fellowship in MS&E

Jianhe Guo (Fan Research Group)
- Howard Hughes Medical Institute (HHMI) International Research Fellowship
- Professional Development Award, The Graduate School

Michael Klein (Manthiram Research Group)
- Professional Development Award, The Graduate School

Lele Peng (Yu Research Group)
- Professional Development Award, The Graduate School

Xiaolei Peng (Zheng Research Group)
- 2016 ASME Nanoengineering for Medicine and Biology Conference Poster Winner

Somaye Rasouli (Ferreira Research Group)
- Best Poster Presentation, Frontiers of Electron Microscopy in Materials Science (FEMMS)
- Professional Development Award, The Graduate School

Ryann Rupp (Taleff Research Group)
- Professional Development Award, The Graduate School
- Scholarship, EBSD 2016 Topical Conference, Microanalysis Society

Daniel Sanchez (Lu Research Group)
- GEM PhD Fellowship

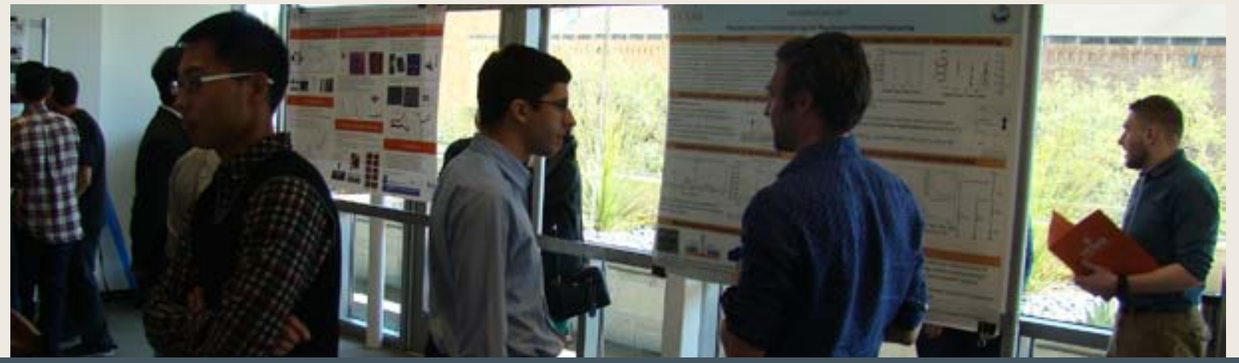
Ye Shi (Yu Research Group)
- Office of Graduate Studies Continuing Fellowship
- Professional Development Award, The Graduate School
- Nano Portfolio Program Travel Award

Laura Spinella (Ho Research Group)
- Best Student Paper, IEEE International Interconnect Technology Conference (IITC)
- Professional Development Award, The Graduate School
- Graduate Engineering Council Travel Grant

Haley Stowe (Hwang Research Group)
- Professional Development Award, The Graduate School

Sean Sullivan (Shi Research Group)
- Professional Development Award, The Graduate School

Xioahan Wang (Willson Research Group)
- Professional Development Award, The Graduate School



TEXAS
The University of Texas at Austin
Materials Science & Engineering
Texas Materials Institute
204 East Dean Keeton St. C2201
Austin, Texas 78712

Congratulations to our 2015-2016 Graduates!

Robert Stover, Ph.D.
Controlled Assembly of Biodegradable Gold Nanoclusters for In Vivo Imaging
Supervisor: Johnston

Guillaume Noiseau, Ph.D.
Film Deposition and Mechanical Properties of Silver Produced by Impaction of Nanoparticles
Supervisor: Kovar

Libin Zhang, Ph.D.
Synthesis and Thermoelectric Properties of Mg_2Si-Mg_2SN Solid Solutions for Waste Heat Recovery
Supervisor: Goodenough & Zhou

Wei Jiang, Ph.D.
Use of Ionic Liquid for Producing Regenerated Cellulose Fibers
Supervisor: Li

Brenton Bennett, Ph.D.
Modeling and Optimization of the Direct Methanol Fuel Cell System: Relating Materials Properties to System Size and Performance
Supervisor: Bard

Sang Ok Kim
Development of Nanostructured Alloy-Based Composite Anode Materials forLithium- and Sodium-Ion Batteries
Supervisor: Manthiram

Chao Liu, Ph.D.
Precision Manipulation of Organic and Inorganic Nanoentities for Optical Biosensing at Deterministic Positions
Supervisor: Fan

Julian Villarreal, Ph.D.
In-Situ Chemical Doping of Silicon Nanowires by Supercritical-Fluid Synthesis
Supervisor: Korgel

Michael Gammage, Ph.D.
LAMA-Produced Metal-on-Oxide Nanoparticles and Films
Supervisor: Kovar

Luke Nicolini, M.S.
Development and Analysis of Stretchable Electronics in Biopotential Monitoring
Supervisor: Lu

Hao Wu, Ph.D.
Flame Retardent Nylon 6 Nanocomposite Fibers by Melt-Processing
Supervisor: Krifa

Xiaohan Wang, Ph.D.
Graphene and its use in Flexible Electronics
Supervisor: Willson

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