



FALL 2017

TECHTRACKS

Materials Science and Engineering
A. James Clark School of Engineering
www.mse.umd.edu

Transparent Wood

More efficient than glass

UNIVERSITY OF MARYLAND / FEARLESS IDEAS

Cover Story

Transparent Wood: More efficient than glass

Researchers at the University of Maryland have made a block of wood transparent, which may be useful in building materials and light-based electronics systems. **Liangbing Hu**, an Associate Professor in the Department of Materials Science Engineering, and his team have removed the molecule in wood – lignin – that makes it rigid and dark in color. They left behind the colorless cellulose cell structures, filled them with ep-



oxy, and came up with a version of the wood that is mostly see-through. "It can be used in automobiles when the wood is made both transparent and high strength," said **Mingwei Zhu**, a visiting professor at the University of Maryland. "You could also use it as a unique building material."

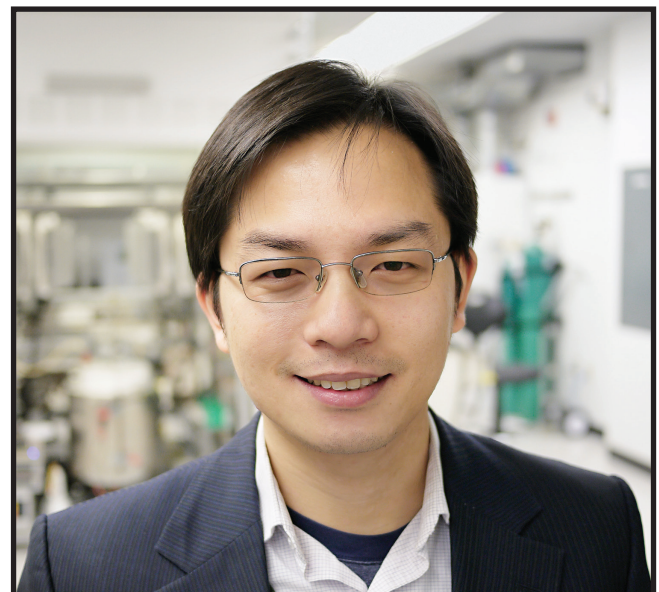
Xylem and phloem, the vascular tissues that distribute water and nutrients throughout the tree, are vertically aligned channels in the wood. These natural structures can disperse light, too, after the wood has been treated. The resulting wood product has both high clarity and high haze – the quality of scattering light. This could be useful in making electronic devices more comfortable to look at, in addition to helping solar cells trap light - the high haze would keep the light bouncing around close to where it would be absorbed by the solar panel.

Hu's team compared how the materials performed and how light worked its way through the wood when they sliced it two ways: the first went with the

grain of the wood, so that the channels passed through the longest dimension of the block. They also tried slicing it against the grain, so that the channels passed through the shortest dimension of the block. The short-channel wood proved slightly stronger and marginally less brittle. Although the lignin had been removed, the epoxy substitute made the wood four to six times tougher than the untreated version.

"Potentially, the wood could be made to match or even exceed the strength of steel per weight, with the added benefit that the wood would be lighter in weight," Hu explained.

Hu's team also investigated how the different directions of the wood affected the way light passed through it. When laid atop a grid, both kinds of wood showed the lines clearly. When lifted just above the grid, the long-channel wood still showed the grid, but not quite as visibly. The short-channel wood, on the other hand, when lifted those same few millimeters, made the grid completely invisible. This research, entitled, "Highly Anisotropic, Highly Transparent Wood Composites," was published in the journal *Advanced Materials*.



Small Defects Can Make Whole Materials Frustrated

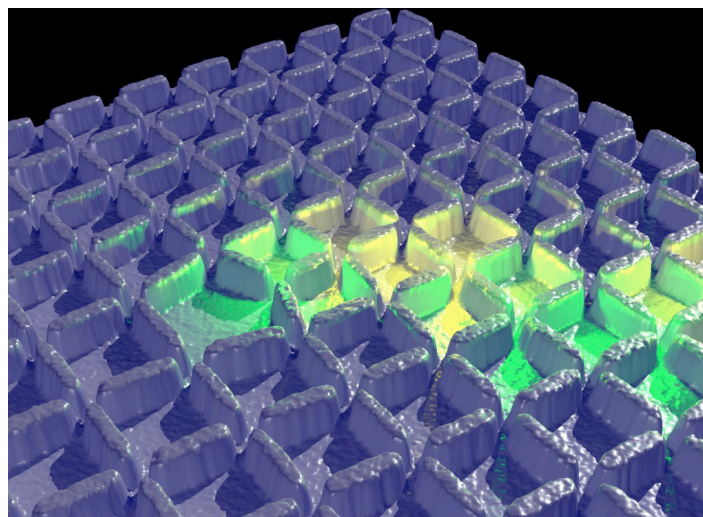
A ground state -- the lowest possible level of energy that an atom or a group of atoms can achieve -- is a property of all systems of materials. Some materials, however, don't have an established ground state that scientists can reliably identify. Researchers at the University of Maryland have identified one reason this could be happening: tiny defects causing bigger ripples. Each atom in a material has spin - basically, its magnetic orientation. Atoms in a material influence one another through their spin and are happiest when neighboring atoms have opposite spins, just as magnets' opposite poles attract. When all atoms are at peace with their neighbors -- when they're all at equilibrium -- they've achieved their ground state. But what if the material forms a triangle -- what does the third spin do? It would, at the very least, throw a few nearby atoms off balance as they adjust to the oddball's spin. When defects create this type of imbalance, scientists call them topological defects, and they are almost inevitable in most crystalline materials.

MSE Associate Professor **John Cumings** and UMD Physics alumnus **Jasper Drisko**, deliberately made a defect in a model of a material and found that a small change made a big difference across the whole material.

"No material is perfect, but sometimes scientists assume that a small defect doesn't have an overall effect," said Cumings. "Our work shows that a small defect can alter the ground state across the whole material."

They used a magnet-based model of a type of material called spin ice, which is easy to manipulate. Each tiny magnet is only a few hundred nanometers long -- one thousand times less than the thickness of a sheet of paper. Drisko's previous work demonstrated that the best material to use in the model is an iron-palladium alloy, which allows the magnets to flip freely and find their happiest, ground state arrangements. Their tiny size means that the magnet can only orient in one direction.

The pristine structure of spin ice is a square with pairs of atoms spinning together in unison. The scientists replicated those squares in their magnet model, but with a small change: one square in the middle of the material was changed to a pentagon shape. This confused, or more technically, 'frustrated,' the magnets,



which then showed a path of upended magnets all the way to the edge of their sample. Worse, it wasn't as though the same path appeared every time -- introducing a defect created other paths in different directions, or even in circles. In any case, the material, because it was disturbed, couldn't reach its ideal consistent ground state.

A paper based on the study, entitled, "Topological frustration of artificial spin ice," was published in the peer-reviewed journal *Nature Communications*.

"This work shows the power of intentional design in artificial spin ice. Because the nanostructure can be designed with a defect included, and then probed in detail, artificial spin ice provides a unique window into how nature accommodates defects in regular structures," says **Peter Schiffer** of the University of Illinois at Urbana-Champaign.

"Our work has broad implications for other materials," said first author Drisko. "Other systems beyond the spin ices could be frustrated or complicated by topological defects and this is something that scientists need to consider more often in theoretical and experimental observations, when they are considering ground states."

A co-author on the paper was a high school student at the time the work was done. **Thomas Marsh**, a St. Albans High School alumnus when he assisted with the data analysis, now attends Hamilton College.

The work was supported by a NSF Career Award.

RESEARCH NEWS

Engineering the Preservation of Cultural Heritage

Miriam “Mimi” Hiebert, a third-year Ph.D. student in the Department of Materials Science and Engineering, first became fascinated with studying and preserving antiquities thanks to an Egyptian mummy named “Tia.”

As an undergraduate, Mimi helped a visiting archeological conservator repair her school’s resident mummy using chemical analysis. Through this newfound interest, Mimi incorporated MSE Interim Chair **Ray Phaneuf’s** work using atomic layer deposition (ALD) to create a thin, protective film on flat surfaces, which coats and preserves silver artifacts. She came to the Clark School specifically to enter the conservation science field, where she is able to use the University of Maryland’s unique Radiation Facilities in her research.

A few times a week, Mimi heads to the Maryland University Training Reactor (MUTR) on campus to get to work. For her thesis project, Mimi is using nuclear radiation to learn how to better preserve porous items such as stone and glass from water and erosion damage.

Mimi is studying limestone from Lecce, Italy; one of the city’s main exports because of its pliability,

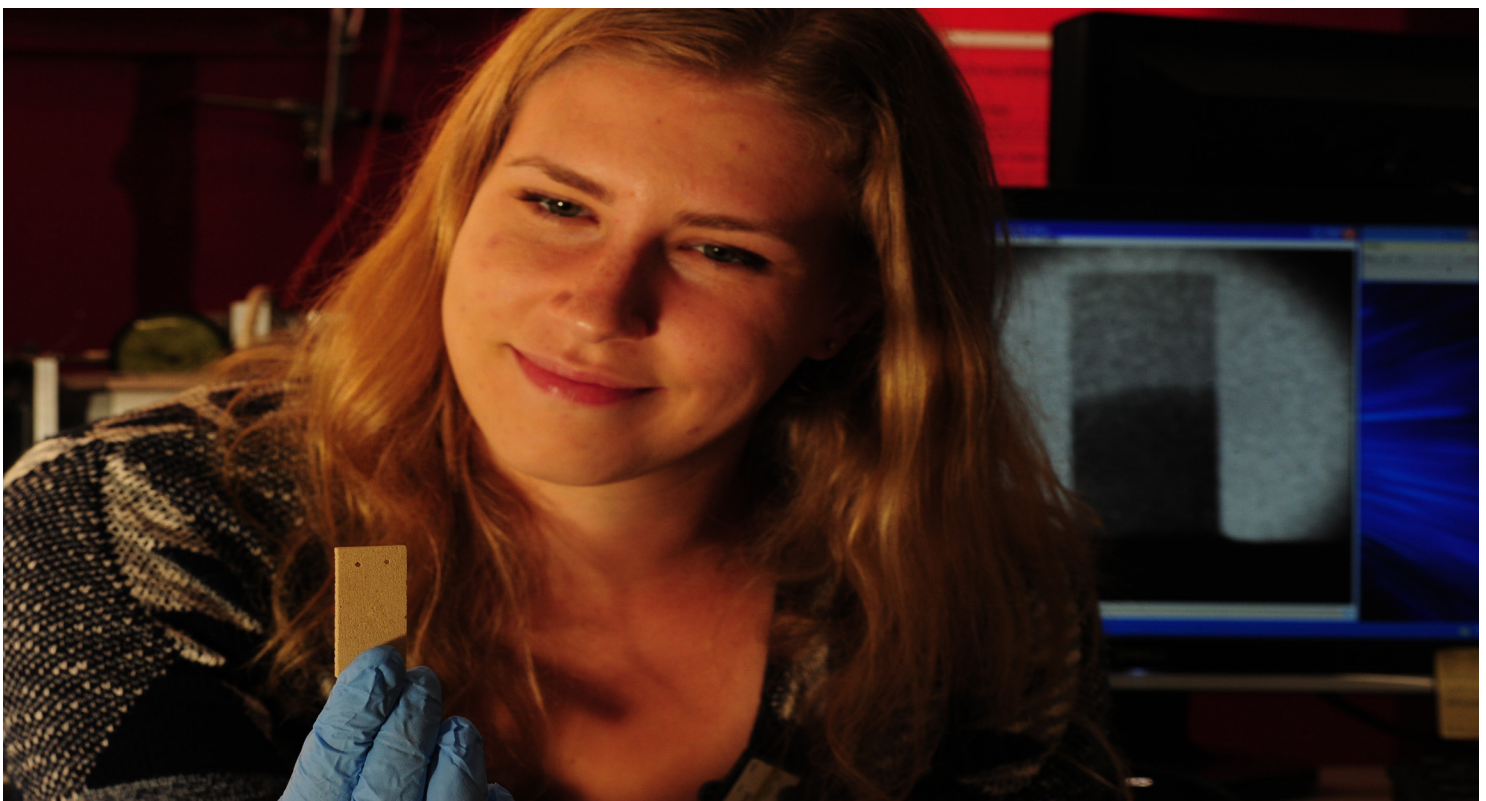
making it ideal for sculptures. However, the stone is extremely susceptible to weathering, so eventually these antiquities will be lost unless they can be protected.

Because there isn’t a good way to see water inside an opaque substrate like stone, Mimi uses the neutron imaging facilities at MUTR to take pictures, much like an x-ray machine at a doctor’s office. During the ALD process, the neutrons are stopped by water and the stone becomes virtually invisible, so Mimi can see how water is moving inside the stone.

MUTR not only serves as a research facility, but also trains undergraduates and graduates to become licensed reactor operators.

“It’s a gem of the university,” says **Timothy Koeth**, director of the UMD Radiation Facilities. “There are only 31 nuclear training and research reactors across the U.S., and only a handful are at schools. MUTR is a very small, low-power reactor that uses an inherently safe fuel called TRIGA built for training reactors.”

As Mimi continues her research, she will move on to using the same ALD techniques in MUTR on corroded glass. She hopes to become a museum conservation scientist, and her hands-on research experience at the Clark School has set her up for success in this small but fascinating field.



UMD Radiation Facilities Illuminated

On November 18th, 2016, the University of Maryland Radiation Facilities, which houses the Maryland University Training Reactor (MUTR), hosted 10 visitors including 7 individuals representing various Congressmen/women and Senate Committees. Some visited out of personal interest, or sheer curiosity, while others routinely visit such sites around the U.S. with the end goal of improving current nuclear legislation.

UMD Radiation Facilities Director and Research Associate Professor **Timothy Koeth**, along with Faculty Assistant **Amber Johnson** and MSE graduate student, **Travis Dietz**, led the group on a tour of the facilities. Koeth discussed the numerous advantages of nuclear technology; for example, how it can be utilized in the treatment of cancer.

Another advantage of nuclear energy is that it doesn't emit carbon dioxide, so its contribution to global warming is zero. It's more reliable than solar or wind power, cheap to produce, and it's efficient.

"Unfortunately," said Koeth, "the UMD reactor is dealing with obsolescence." Finding parts to maintain the reactor, built in 1974, becomes more difficult each year. Indeed, research-training reactors are an endangered species (there are currently only 31 in the U.S.) and more are unlikely to be built. For these reasons, UMD is committed to preserving and maintaining the Facilities.

After a quick view inside the reactor core, which encases the soft, blue glow of Cherenkov radiation inside concrete and 15 feet of water, the visitors stopped at the newest addition to the Radiation Facilities: an educational cyclotron. It's a sophisticated particle accelerator built by students, for students. In a setting unlike anything else in the world, Koeth's cyclotron is a research grade machine that is dedicated to undergraduate instruction, teaching the science and technology of particle accelerators with an emphasis on hands-on learning. Practically every subsystem was designed and built by undergraduate students.

This cyclotron, which was started by Koeth in his parents' home over 20 years ago, moved to UMD during the summer of 2016. It will be incorporated into a Capstone Design course where the students are currently building a next-generation cyclotron: a 5 MeV proton accelerator that will be placed into research service once completed.

"Our cyclotrons give students a hands-on opportunity to operate an accelerator and directly observe many fundamentals of beam physics and encounter the frustrations and triumphs an accelerator physicist at Fermilab or CERN/LHC might, all in a classroom setting," said Koeth.

The NRC issued the MUTR a renewed operating license in December, 2016, valid for 20 years. In March 2017, the DOE provided lightly, irradiated fuel ensuring the continuation of the nuclear science program.



Rabin's Research Team Wins Seed Grant Funding for Novel Sensor Technology

MSE researchers **Oded Rabin** (Associate Professor), **Robert Briber** (MSE Professor & Clark School Associate Dean for Research) and **Xin Zhang** (Assistant Research Scientist) have recently received funding from the UMD Ventures Seed Grant Program for their proposal, "Nanoparticle Array with Tunable Nanoparticle Size and Separation." This grant will support the development of a prototype fiber-optic sensor to detect and analyze individual chemical compounds based on patented UMD technology. The sensor utilizes a nanoparticle array as a surface-enhanced Raman spectroscopy (SERS) substrate: the nanoparticles – made of silver, aluminum or, in this case, gold – will capture a chemical on their surface and boost the efficiency of the Raman light-scattering process. If successful, the sensor will be incorporated in a hand-held spectrometer, which will be more reliable and versatile, easily portable, and cheaper than current Raman analysis methods.

"We have witnessed in the 21st century the miniaturization of spectrometers for field analysis and homeland security applications," said Dr. Rabin. "However, the SERS technique is still confined to the laboratory environment."

This invention will soon move out of the laboratory and become commercially available. The research group, including UMD graduate student Kunyi Zhang and alumnus Romaine Isaacs, is working in conjunction with AccuStrata, Inc. – a research and development firm specializing in optics, semi-conductors and thin film technology, which started at the University of Maryland busi-

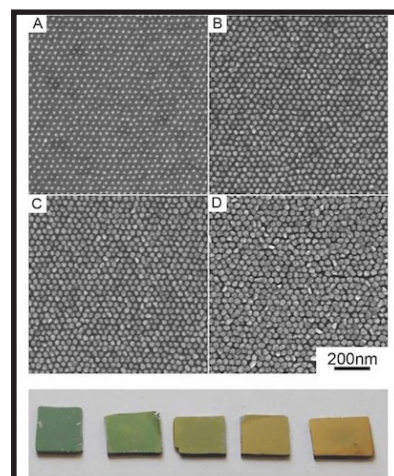
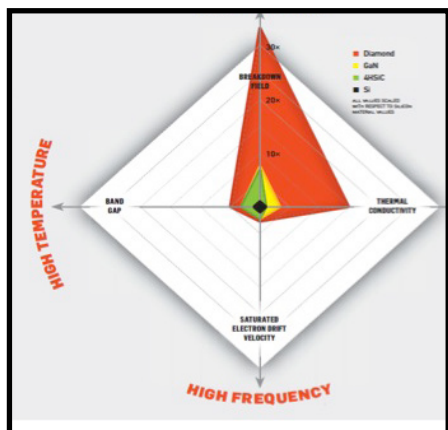


Figure (right): SEM micrographs (top) and optical images (bottom) of metamaterial SERS substrates with varying nanoscale structure.

Christou Leads Research of Diamond Electronics

Diamonds have exceptional physical and electrical properties, which is why the U.S. DoD is keen to utilize the material in RF (radio frequency) electronic devices. MSE Professor **Aristos Christou** has been selected by the Defense Threat Reduction Agency to lead the effort for revolutionizing diamond electronics.

Why diamond and not some other semiconductor material? The performance limits of diamond vastly exceed the limits of other materials, such as silicon carbide (SiC) and gallium arsenide (GaN). They are, for example, thermally conductive, can handle high voltages and do a much better job of retaining energy when compared to silicon. Additionally, diamond offers greater inherent radiation hardness – an advantage over various power SiC and GaN devices with known problematic radiation effects. As a semiconductor, however, diamond has fundamental issues, which have not yet been resolved. The usual processes for semiconductor doping that work for silicon electronics aren't applicable.



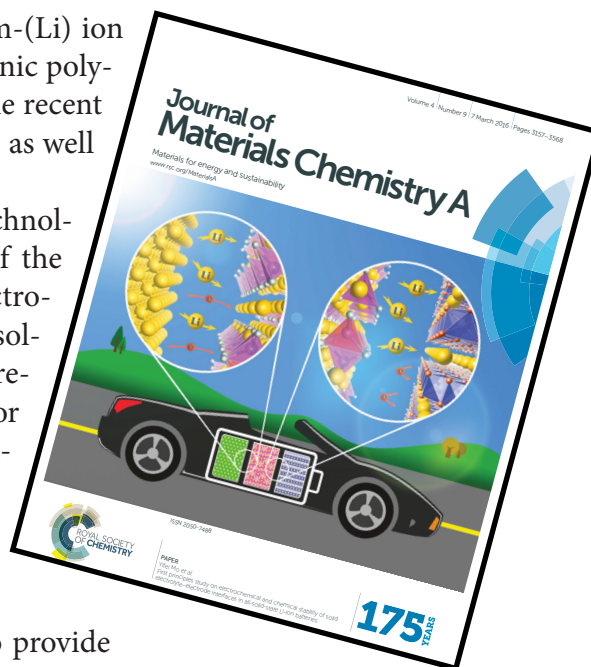
Dr. Christou hopes to overcome these problems via a hydrogen-terminated surface, which has a negative electron affinity resulting in the establishment of a two-dimensional hole gas (2DHG) transport layer just below the surface. The 2DHG layer has both high carrier mobility and high carrier concentration, which should lead to a high efficiency device that doesn't suffer from resistive losses. Christou also hopes to ensure that

MSE Research Group Publishes Series Study on All-Solid-State-Batteries

Safety concerns have long been the Achilles' heel of the lithium-(Li) ion battery. Commercial Li-ion batteries use highly flammable organic polymer electrolytes. These electrolytes have been responsible for the recent incidents of the Tesla vehicle bursting into flames upon impact, as well as the massive recall of Samsung Galaxy 7.

UMD researchers are focusing on novel battery technology that is safe and boasts higher energy density than that of the Li-ion battery. The idea is to replace organic polymer electrolytes with *non-flammable* ceramic solid electrolytes. All-solid-state Li-ion batteries have higher energy density, a high recharging rate and a longer cycle life. One critical problem for the development of such technology is its elevated, interfacial resistance, which continues to limit battery performance.

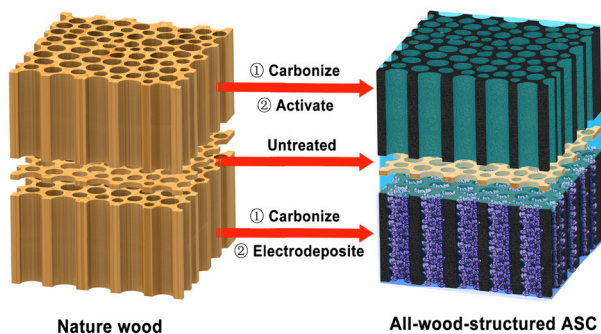
To overcome such difficulties, MSE Assistant Professor **Yifei Mo** is using state-of-the-art computational modeling to study these interfaces. Using UMD supercomputers, quantum mechanical modeling of materials phenomena is performed to provide novel insights of the underlying problems. Dr. Mo's research has been published in a series of papers, and was featured on the cover of the *Journal of Materials Chemistry A*.



MSE Scientists Demonstrate the Possibilities of Organic Energy Storage

Liangbing Hu's group used a carbonized oak leaf, pumped full of sodium, as a demonstration battery's negative terminal, or anode. Whereas most rechargeable batteries sold today use lithium, sodium would hold more charge, but can't handle as many charge-and-discharge cycles as lithium. One of the roadblocks has been finding an anode material that is compatible with sodium. In this case, the group heated the leaf for an hour at 1,000 degrees Celsius to burn off all but the underlying carbon structure.

"A leaf is designed by nature to store energy for later use, and using leaves in this way could make large-scale storage environmentally friendly," said Hu, a MSE Associate Professor. Hu has also tried using wood fiber to create a battery, and recently, he succeeded in making another type of energy storage device - a supercapacitor, made entirely of wood. Unlike a battery, a supercapacitor doesn't require a chemical reaction. Instead, it attracts energy to one of its ends, meaning it charges and discharges quickly. Supercapacitors are often used in regenerative brakes for hybrid cars, where a brief surge of energy is all that's needed.



When alive, trees grow channels to draw water from the ground. Hu's group used those channels to transmit the electrical charge. The other end of the supercapacitor is baked at a high temperature and then filled with electrically conductive material. In the middle, a piece of unbaked wood is filled with a gel that conducts ions. This 'wood sandwich' (left) works as well as a traditional metal-oxide supercapacitor and can stand up to ten thousand charge and discharge cycles without losing capacity. To view a *Voice of America* video of this research, visit this link - https://go.umd.edu/woodusesvideo_mse

Honors & Awards

Gary Rubloff Named Distinguished University Professor



Gary Rubloff was recently named a Distinguished University Professor. Dr. Rubloff has a joint appointment in the Department of Materials Science and Engineering and the Institute for Systems Research.

Distinguished University Professor is the highest academic honor that UMD offers, thus is reserved for a small number of distinguished scholars. These scholars are selected from faculty members who have been recognized nationally and internationally for the importance of their achievements.

Rubloff, who received his Ph.D. from the University of Chicago in 1971 and joined UMD in 1996, is the founding and current director of the Maryland NanoCenter. The NanoCenter promotes major nanotechnology research and education initiatives, provides one-stop shopping for those seeking expertise or partnerships at Maryland, and supplies infrastructure to facilitate nanotechnology activities at UMD.

Undergraduate Student Zinab Jadidi Receives

Zinab Jadidi, an undergraduate student in the Department of Materials Science and Engineering at UMD, was born and raised in the heavily polluted city of Tehran, Iran. Witnessing the destructive effects air pollution can have on people and their environments was the motivation behind Jadidi's pursuit of clean, renewable energy as a field of study.

During her junior year at UMD, she was introduced to the Renewable Energy and Advanced Devices (READ) Lab, headed by MSE Assistant Professor, Marina Leite. Shortly thereafter, Jadidi received an ASPIRE award from the MD Technology Enterprise Institute (Mtech) to conduct research on all-solid-state batteries. In the summer of 2016, she became an intern in the NSF Transportation Electrification REU Program within the UMD Department of Electrical & Computer Engineering, starting a new project under the supervision of Dr. Leite.

"Working in Professor Leite's group helped me develop critical thinking skills and improve my oral and written communication skills," said Jadidi. "Moreover, I gained invaluable, hands-on experience at the UMD Nanocenter cleanroom (FabLab) and AIM Lab."

Jadidi has maintained an A-average in all of her upper level courses, been involved in multiple research projects, participated in numerous conferences, and even made time for extracurricular activities, such as a membership in the Women In Engineering (WIE) society, where she volunteers with grade-school Girl Scouts as an electrical engineer lab leader. For all of these reasons, the National Science Foundation (NSF) awarded this accomplished student a prestigious Graduate Research Fellowship. She will receive an annual stipend of \$34,000, in addition to \$12,000 in tuition support, over a three-year period. This award will give her the freedom to conduct her research at a U.S. institution of her choice. Jadidi has recently accepted admission into the MSE Ph.D. program at U.C. Berkeley where she will join a computational materials science group focusing on battery technology.

Jadidi says her long-term goal is to become a leader in the research field of energy storage and renewable energy systems.



Mohamad Al-Sheikhly Receives IIA Laureate Award

MSE Professor **Mohamad Al-Sheikhly** was named a Laureate of the International Irradiation Association (iia) at the 2016 International Meeting on Radiation Processing (IMRP), which took place November 7-11, 2016, in Vancouver, British Columbia, Canada.

Dr. Al-Sheikhly has a Ph.D. in Radiation and Biophysical Chemistry from Newcastle University in the U.K. He is the Director of the UMD Laboratory for Radiation and Polymer Science and has been a Guest Scientist at the NIST since 1985. Al-Sheikhly was also the Director of the Maryland University Training Reactor (MUTR) from 1999-2013. His research activities have covered a wide range of disciplines in the areas of radiation effects on materials: radiation chemistry and processing, radiation-nuclear, bioengineering, polymerization, nano composites, and reliability science and engineering. Al-Sheikhly has made major contributions in these fields with an emphasis on the broad topics of radiation and materials engineering. He has been published in numerous peer-reviewed journals in the fields of fundamental radiation chemistry and physics, fast kinetics mechanisms, radiation processing, radiation dosimetry, electron synthesis of nano materials, and nuclear materials for Generation IV nuclear reactors. He has delivered more than one hundred invited and keynote presentations at national and international conferences.

The Laureate Award, established in 1978, is the highest honor that irradiation community members can receive. This award is presented to individuals who have made “outstanding scientific, technological, entrepreneurial, business or academic contribution to the irradiation community and served as a leader or role model for excellence in irradiation.”

The iia is a NGO, supported by the IAEA, which encourages its members to develop safe and beneficial uses of irradiation technology. The IMRP, which takes place every three years, provides a platform for anyone interested in irradiation science and its applications to gather and discuss issues related to radiation processing.

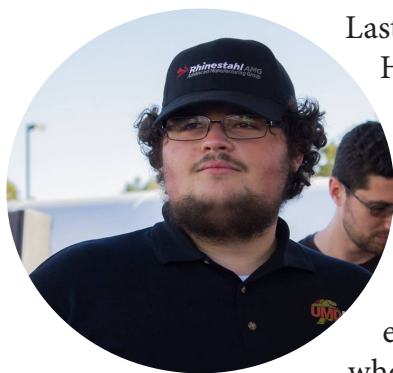


STUDENT NEWS

MSE Students Apply Their Studies to Off-Campus Competitions

On December 13, 2016, MSE Senior **Delaney Jordan** (pictured right) competed along with fellow Clark School team members **Marcos Colon-Pappaterra** (Mechanical Engineering) and **Kevin Merrick** (Computer Engineering) in the Team Ninja Warrior 'College Madness' television show. The trio met via Gymkana, a UMD-based gymnastics and acrobatic group. Last summer, all three students applied for the competition, showing off their brains and brawn, and became one of 16 University team contenders. The best part of the experience, they said, was representing science and engineering.

“You don’t have to pick one thing to be. You can be smart and you can be strong,” said Jordan. “I think the three of us are good examples of that.”



Last fall, MSE Sophomore **John “Hoss” Galuardi** (pictured left) joined the UMD Hyperloop Team to assist in the development of UMD’s Hyperloop pod, dubbed ‘Prometheus,’ for the SpaceX Hyperloop Pod Competition. The competition is designed to encourage student innovation and accelerate the development of a prototype, giving way to a fast, safe, and cost-effective mode of transportation.

The second round of the competition, focusing on maximum speed, is set to take place during the summer of 2017 when all teams will come together to test their pods on a one-mile track in Hawthorne, California. Galuardi, whose interests include hands-on engineering and materials application, is currently working out the pod design kinks (e.g. vacuum conditions, magnetic components, budgetary restrictions). He hopes to gain experience in a non-academic, engineering setting, working in the aerospace field, where he can refine his design skills.

“I’ve only been on the team for about 5 months, and I’ve already learned so much,” Galuardi said. “It’s been incredible to augment my coursework with something like this, where I’m solving actual problems and collaborating with people from different fields of study – they’re a phenomenal group!”



RECENT DISSERTATIONS

Fall 2015

Amy Marquardt - "Novel Protective Coatings for Silver and Copper Alloy Cultural Heritage Objects Using Atomic Layer Deposited Metal Oxide Barrier Films." Advisor: Raymond Phaneuf.

Jeremy Ticey: "Carbon-sulfur Nanocomposites for Lithium-sulfur Batteries." Advisor: John Cumings.

Spring 2016

Garth Egan: "Understanding the Reaction Mechanism of Aluminum Nanocomposite Thermites." Advisor: Michael Zachariah.

Romaine Isaacs: "Characterization of Copper Covetic Bulk and Films: Copper with High Carbon Content." Advisor: Lourdes Salamanca-Riba.

Hanna Nilsson: "Controlling Nanostructures for in-situ TEM Characterization." Advisor: John Cumings.

Mert Vural: "Polymer-nanoparticle Composites for Applications Inflexible Electronics." Advisor: Peter Kofinas.

Slavica Grdanovska: "Characterization of a Novel Photonic Crystal Sensor to Monitor Radiation-induced Damage of Nuclear Fuel Materials." Advisors: Robert Briber and Timothy Koeth.

Summer 2016

Greg Hitz: "Development of Li⁺ and Na⁺ Conducting Ceramics and Ceramic Structures for Use in Solid State Batteries." Advisor: Eric Wachsman.

Chanyuan Liu: "Nano-Engineering of Densely Packed Electrochemical Energy Storage Architectures By Atomic Layer Deposition." Advisor: Gary Rubloff.

Dominik Metzler: "High Precision Plasma Etch for Pattern Transfer: Towards Fluorocarbon Based Atomic Layer Etching." Advisor: Gottlieb Oehrlein.

Joshua Taillon: "Advanced Analytical Microscopy at the Nanoscale - Applications in Wide Bandgap and Solid Oxide Fuel Cell Materials." Advisor: Lourdes Salamanca-Riba.

Jiayu Wan: "Manipulation of Ions, Electrons, and Photons in 2D Materials." Advisor: Liangbing Hu.

Fall 2016

Christopher Pellegrinelli: "Oxygen Exchange Mechanisms on Solid Oxide Fuel Cell Cathode Materials in the Presence of Gas Phase Contaminants." Advisor: Eric Wachsman.

Spring 2017

Kevin Dwyer: "*In situ* Enrichment and Epitaxial Growth of 28 Si Films via Ion Beam Deposition." Advisor: John Cumings and Josh Pomeroy.

Wonseok Hwang: "Structure-Property Relationships in Crystalline-Amorphous Block Copolymer: Synthesis, Phase Behavior and Mechanical Properties." Advisor: Robert Briber.

Donald Jenket: "Failure Mechanisms of Ultra High Molar Mass Polyethylene Single Fibers at Extreme Temperatures and Strain-Rates." Advisor: Mohamad Al-Sheikhly.

STUDENT AWARDS

DEPARTMENT AWARDS -

Department of Materials Science and Engineering Chairman's Outstanding Senior Award: **Luke Bittner (2016)**, **Maria Pascale (2017)**

Department of Materials Science and Engineering Outstanding Materials Student Service Award: **Drew Stasak & Claire Tomaszewski (2016)**, **Joshua Eng-Morris & Sabrina Curtis (2017)**

Department of Materials Science and Engineering Student Research Award: **Garrett Wessler (2016)**, **Julia Downing & Drew Stasak (2017)**

CLARK SCHOOL AWARDS -

A. James Clark School of Engineering Leadership Award: **Luke Bittner (2016)**

A. James Clark School of Engineering International Student Award: **Helen Lan (2017)**

A. James Clark School of Engineering Harry K. Wells Graduate Fellowship: **Emily Hitz & Chen Gong (2017)**

UNIVERSITY AWARDS -

Graduate School All-S.T.A.R. Fellowship: **Elizabeth Tennyson (2017-2018)**, **Miriam "Mimi" Hiebert (2016-2017)**

Graduate School Outstanding Graduate Assistant Award: **David Shahin (2017)**

NATIONAL AWARDS -

NSF Graduate Research Fellowship: **Garrett Wessler (2016)**; **Zinab Jadidi (2017)**

SOCIETY AWARDS -

Materials Research Society, Grad Student Silver Award: **Joshua Taillon (2016)**

Smithsonian Fellowship Award: **Miriam "Mimi" Hiebert (2017)**



Department of Materials Science Engineering
University of Maryland
4418 Stadium Drive
College Park, Maryland 20742-2111

Image explanation: The Leite group at UMD is developing novel materials formed by metal alloys, with optical response not found in nature, potentially enabling 'plasmonic' devices with superior performance. This illustration represents the interactions between light and alloyed nanoparticles formed by coin-age metals (e.g. gold and silver). These structures are formed upon the deposition of a metallic thin film onto glass, followed by a heating treatment that causes the dewetting of the film, similar to oil droplets in water. The team (UMD students *Chen Gong*, *Zack Benson*, *Alan Kaplan*, and post-doc *Mariama Dias*) is also investigating the properties of low-cost metal alloys (e.g. aluminum and copper) and designing complex 3-dimensional geometries.

Techtracks is published for affiliates of the Department of Materials Science Engineering at the University of Maryland. Your news and comments are welcome. Please send them to:

Materials Science & Engineering
4418 Stadium Drive
University of Maryland
College Park, MD 20742
Email: mse@umd.edu