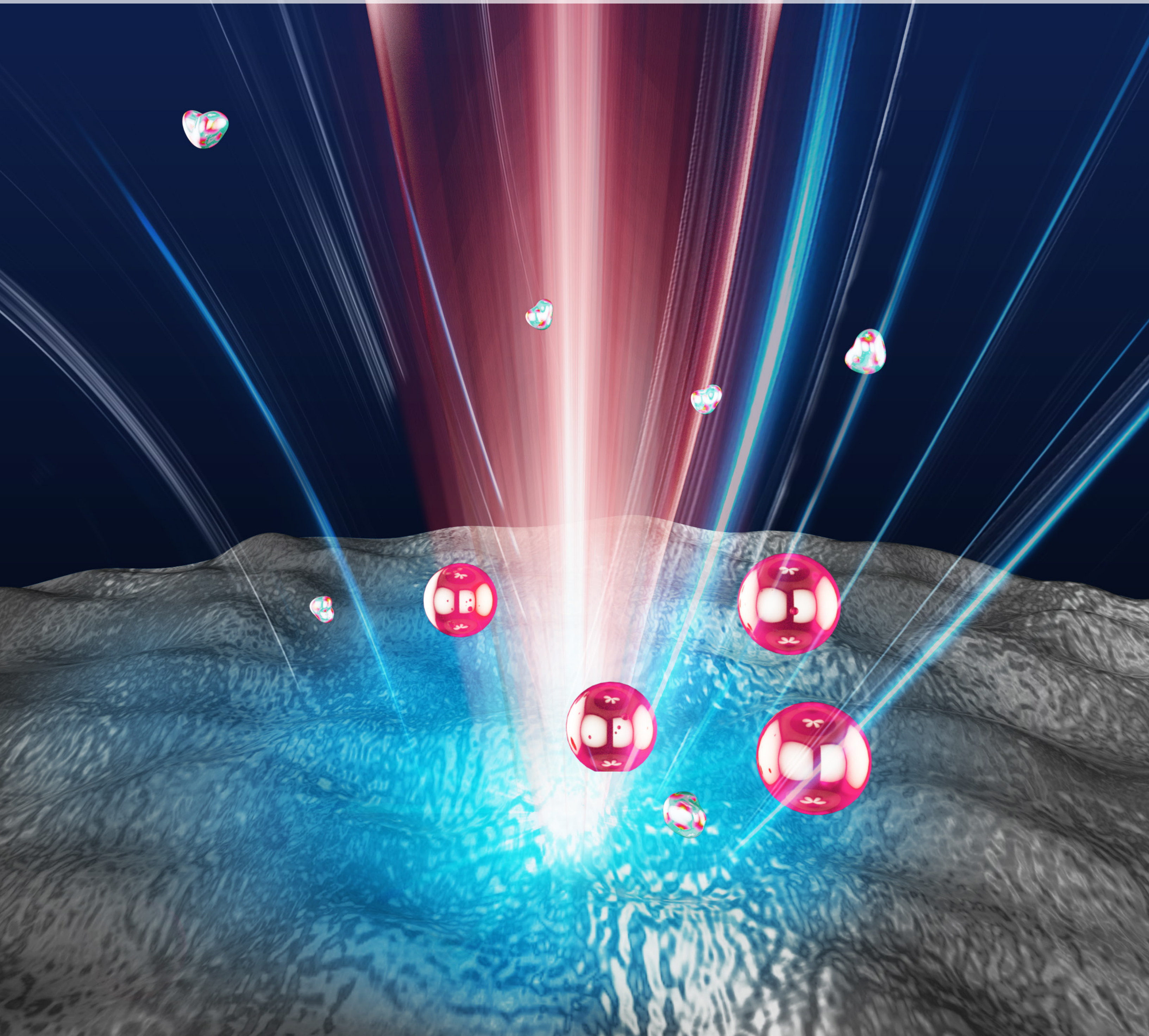
The University of Texas at Austin

Texas Materials Institute

NEWSLETTER

ACADEMIC YEAR 2020 - 2021



Greetings from the Director

Greetings!

I am pleased to present to you the Materials Science and Engineering Program and Texas Materials Institute (TMI) Newsletter for the 2020 - 2021 academic year. Our faculty, staff, and students have continued to navigate during unprecedented times and excel in an online, in-person, and hybrid format. It took a collective effort to bring our research and teaching back to life after the initial closure, and I am proud of what we have accomplished.

We received great news this year when two of our faculty landed major grants that will help propel our research even further. A $7.5 million Multidisciplinary University Research Initiative (MURI) grant was awarded by the U.S. Department of Defense (DoD) to a team led by Li Shi for their work in Electronic Switching of Thermal Transport. A $3.2 million grant was awarded by the U.S. Defense Advanced Research Projects Agency (DARPA) to a team led by Guihua Yu for developing advanced technologies to capture water as needed from the air and provide clean drinking water for soldiers.

To excel in our research mission, we must maintain state-of-the-art research facilities. With that goal in mind, we recently purchased two thin film deposition tools and a reactive ion etcher as part of the effort to upgrade and replace old instrumentation in our cleanroom facility.

Our students and postdoctoral scholars continue to excel in all areas of their graduate career. Our Materials Science and Engineering graduate program graduated 11 Ph.D. students and 3 M.S. students and brought in a class of 16. We are proud of our faculty for educating and preparing the next generation of engineers to tackle the new challenges we face as a society and provide solutions.

This issue celebrates the resilience of our unit. In the face of continued challenges brought on by the global pandemic, I am heartened by the way we have persevered and continued to teach our great students effectively and conduct high-impact research.

I hope you enjoy reading.

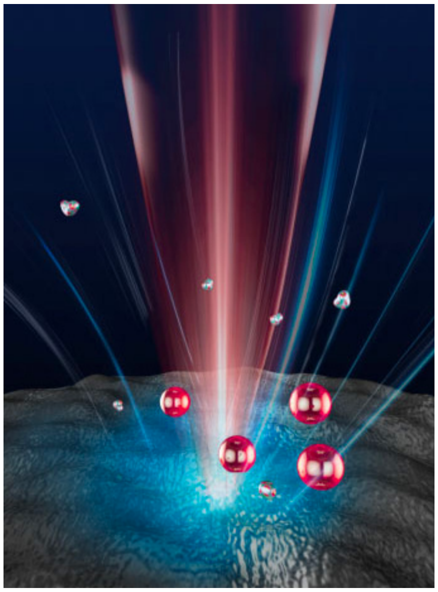
Sincerely,

Arumugam Manthiram
Director, Texas Materials Institute & Materials Science and Engineering Program

Editing and Design
Krista Seidel

IN THIS ISSUE

ON THE COVER



Three years ago, Arthur Ashkin won the Nobel Prize for inventing optical tweezers, which use light in the form of a high-powered laser beam to capture and manipulate particles. Despite being created decades ago, optical tweezers still lead to major breakthroughs and are widely used today to study biological systems.

However, optical tweezers do have flaws. The prolonged interaction with the laser beam can alter molecules and particles or damage them with excessive heat.

Researchers at The University of Texas at Austin have created a new version of optical tweezer technology that fixes this problem, a development that could open the already highly regarded tools to new types of research and simplify processes for using them today.

The breakthrough that avoids this problem of overheating comes out of a combination of two concepts: the use of a substrate composed of materials that are cooled when a light is shined on them (in this case, a laser); and a concept called thermophoresis, a phenomenon in which mobile particles will commonly gravitate toward a cooler environment.

The cooler materials attract particles, making them easier to isolate, while also protecting them from overheating. By solving the heat problem, optical tweezers could become more widely used to study biomolecules, DNA, diseases and more.

"Optical tweezers have many advantages, but they are limited because whenever the light captures objects, they heat up," said Yuebing Zheng, the corresponding author of a new paper published in Science Advances and an associate professor in the Walker Department of Mechanical Engineering. "Our tool addresses this critical challenge; instead of heating the trapped objects, we have them controlled at a lower temperature."

Optical tweezers do the same thing as regular tweezers — pick up small objects and manipulate them. However, optical tweezers work at a much smaller scale and use light to capture and move objects.

Analyzing DNA is a common use of optical tweezers. But doing so requires attaching nano-sized glass beads to the particles. Then to move the particles, the laser is shined on the beads, not the particles themselves, because the DNA would be damaged by the heating effect of the light.

"When you are forced to add more steps to the process, you increase uncertainty because now you have introduced something else into the biological system that may impact it," Zheng said.

This new and improved version of optical tweezers eliminates these extra steps.

The team's next steps include developing autonomous control systems, making them easier for people without specialized training to use and extending the tweezers' capabilities to handle biological fluids such as blood and urine. And they are working to commercialize the discovery.

Zheng and his team have much variety in their research, but it all centers on light and how it interacts with materials. Because of this focus on light, he has closely followed, and used, optical tweezers in his research. The researchers were familiar with thermophoresis and hoped they could trigger it with cooler materials, which would actually draw particles to the laser to simplify analysis.

This research was supported by grants from the National Institutes of Health's National Institute of General Medical Sciences and the National Science Foundation. *Other authors are Jingang Li and Zhihan Chen of UT's Texas Materials Institute; Yaoran Liu of the Department of Electrical and Computer Engineering; Pavana Siddhartha Kollipara of the Walker Department of Mechanical Engineering; and Yichao Feng and Zhenglong Zhang of Shaanxi Normal University's School of Physics and Information in China.*

Article from CSE Communications Team.

Student and Postdoc Spotlight

JIAMING HE

Jiaming He is a 4th year PhD candidate working with Professor Jianshi Zhou on novel magnetic materials and spintronic devices. His previous training was in condensed matter physics and since joining the program, he was shown the materials side of the story and gained a lot of hands-on experiences in crystallography and materials synthesis. This is very eye-opening and exciting for him.

He is currently focusing on synthesis and characterization of single crystalline novel magnetic materials, and he is working with collaborators both within campus and across the country. His research consists of a number of measurements including high resolution X-Ray diffraction, surface treatment and characterization, electrical transport, and magnetic properties measurement. TMI is a great platform for him to do most of these measurements on campus. For ultra-high resolution diffraction measurements that require synchrotron radiation, Jiaming and Professor Zhou collaborate with Argonne National Laboratory to use their facilities. This kind of opportunity and toolchain is imperative to do cutting edge research.

Over the years, Jiaming has been very active in numerous outreach programs. He participated in the GLUE program and mentored 3 undergraduate students until it was interrupted by the pandemic. He is also deeply involved in interactive programs focusing on introducing organized STEM activities to local elementary schools' classrooms. Facing the challenge brought by the pandemic, he worked with other graduate students to bring the traditional in-person experience online, by using pre-recorded video footages along with a toolkit sent out to the students at home. Jiaming is also involved in other outreach programs such as Explore UT and Girl Day.

SEJAL SHAH

Sejal Shah is a 3rd year PhD student in our program. As a part of Dr. Brian Korgel's research group, her research interests include the optoelectronic properties and applications of semiconductor nanocrystals. During her earlier work in the Korgel group, she synthesized and characterized silicon nanocrystals for use in bioimaging applications. She and her coworkers studied the impact of amines on the photoluminescence of these nanocrystals. They found that exposure to amines results in photoluminescence quenching, which may limit some of the applications of these nanocrystals.

Currently, Sejal is researching indium phosphide as an alternative to cadmium telluride quantum dots for use in light-emitting diodes (LEDs). Indium phosphide nanocrystals are considered promising because they have size dependent photoluminescence and are non-toxic. However, one significant challenge with the synthesis of these nanocrystals is the size control. Poor size control leads to a broadening of the luminescence, which negatively impacts the color purity and suitability for LEDs. Sejal hopes to better understand the formation and growth of indium phosphide nanocrystals by investigating the effect of various precursors on their morphology and optoelectronic properties. Further research into dopants and their effects can also give insight into how to improve the properties further for better commercial viability.

In addition to her laboratory research, Sejal is also interested in community outreach. She has participated as a volunteer in several education and outreach opportunities, such as Girl Day and Explore UT, in collaboration with the CDCM MRSEC (Center for Dynamics and Control of Materials, Materials Research Science and Engineering Center) at UT Austin. As a part of these events, she demonstrated the capabilities of virtual reality technology, allowing children to explore famous landmarks and cities using Google Earth VR. By continuing to participate in outreach opportunities during her PhD, Sejal wants to help promote interest in science and technology in future generations of students.

EMILY BRADY

Emily Brady is a 4th year PhD student in the MS&E program. Her research focuses on the relationship between processing, microstructure, and the mechanical properties in two types of niobium sheet material. Elevated temperature tensile tests and static annealing tests are conducted on these materials under vacuum at 1200 to 1550°C. After testing, specimen microstructure is characterized using electron backscatter contrast imaging and electron backscatter diffraction (EBSD).

Some highlights of her time in the program are the variety in classes offered, mentoring opportunities, and networking opportunities. She enjoyed rounding out her education by taking classes such as proposal writing, additive manufacturing, and corrosion. She has mentored 3 undergraduates and 3 elementary/high school teachers during her time at TMI. Being an undergraduate research mentor gave her experience in teaching students how to conduct research safely and accurately, construct semester long projects, and draft project deadlines. Mentoring elementary/high school teachers helped her grow greatly in her technical communication skills, as she was communicating research skills and high-level concepts to adults outside their fields of expertise. Finally, she has had many networking opportunities during her PhD program. She presented a poster at the CINT Annual Meeting in 2019 and presented at The Minerals, Metals, and Materials Society (TMS) conferences from 2019-2021. During the TMS 2019 conference, Katherine Radar (TMI 2021 graduate) and she were the first team to compete in the biennial TMS Bladesmithing competition, where they won the Best Poster Award. When Emily is not in the lab, she likes to sew, play violin, read sci-fi/fantasy and rollerblade.

KRISHNA SHAH

Krishna joined the MAPLE lab at TMI in Fall 2019 as a postdoctoral scholar. Prior to joining MAPLE lab, his knowledge and research experience in the area of electrochemical energy storage had been limited to studying heat transfer in batteries. He always desired to expand his research breadth by getting involved in the core battery research but hadn't been able to break the barrier due to the lack of background in electrochemistry and opportunity to learn. Dr. Venkat Subramanian offered him the opportunity to join his research group and gave him complete freedom to learn and get involved in a wide variety of research happening in the group. By interacting with students, other postdocs and Dr. Subramanian in a truly open and collegial environment, in a relatively short time, he was able to learn a lot about batteries and apply his understanding to help the ongoing research in the lab.

The various research areas he was involved in included developing models and simulation tools for lithium metal anode based battery system, modeling degradation in batteries by developing and utilizing physics based models, developing model for next generation nanostructured composite foil anode based battery system invented in Manthiram lab at TMI, conducting experiments to study degradation in batteries under ultrafast switching load type conditions, developing flight-battery coupled simulation framework, developing thermal model for lithium-sulfur battery, and techno-economical analysis for the nanostructured composite foil anode. In addition to this, he led the effort to set up the new experimental lab, contributed in writing several multinstitution proposals, assisted in other TMI related activities, and mentored/colloborated with a diverse group of students and postdocs. During his time here, he was selected among the Rising Stars in Mechanical Engineering and was invited to attend a workshop focused on improving diversity, equity, and inclusiveness in STEM. Krishna was also awarded a travel grant to give a talk at the Electrochemical Society Meeting. The collaborative research he conducted at MAPLE lab under the guidance of Dr.Subramanian has led to one Editor's Choice Perspective article in the Journal of Electrochemical Society, with multiple other manuscripts currently in the process of being submitted to the top journals in the battery field. He recently joined the Mechanical Engineering department at the University of Alabama as a tenure-track faculty. His time in the MAPLE Lab at TMI under the guidance of Dr. Subramanian played a pivotal role in his transition to becoming an independent researcher.

MURI Grant

A research team led by Li Shi, Materials Science and Engineering faculty within the Cockrell School of Engineering at The University of Texas at Austin, has been selected by the The Department of Defense (DoD) to lead a $7.5 million Multidisciplinary University Research Initiative (MURI) project for work in Electronic Switching of Thermal Transport.

Earlier this year, the DoD announced $179 million in funding awards to 25 teams that participated in the 2021 MURI competition. The winning teams, will receive five-year grants to pursue basic research that spans multiple scientific disciplines.

Since its inception in 1985, the MURI program has convened teams of investigators with the hope that collective insights drawn from research across multiple disciplines could facilitate the advancement of newly emerging technologies and address unique problem sets. The highly competitive MURI program has made immense contributions to both national defense and society at large. The innovative technological advances from the MURI program help drive and accelerate current and future military capabilities and find multiple applications in the commercial sector.

MS&E student Yajie Huang using a microscope to look at a sample she has prepared.

For the 2021 competition, the Army Research Office, the Air Force Office of Scientific Research, and the Office of Naval Research solicited proposals in 26 topic areas important to DoD and the Military Services. From a merit-based review of the 298 proposals received, a panel of experts narrowed the proposals to a subset from which the 25 finalists were selected.

The proposal was presented by Li Shi and the Co-PIs include: Allan MacDonald (UT Austin), Joseph Heremans (Ohio State University), Josh Goldberger (Ohio State University), David Johnson (University of Oregon), Philip Kim (Harvard), and Arun Majumdar (Stanford).

MURI information provided by DoD.

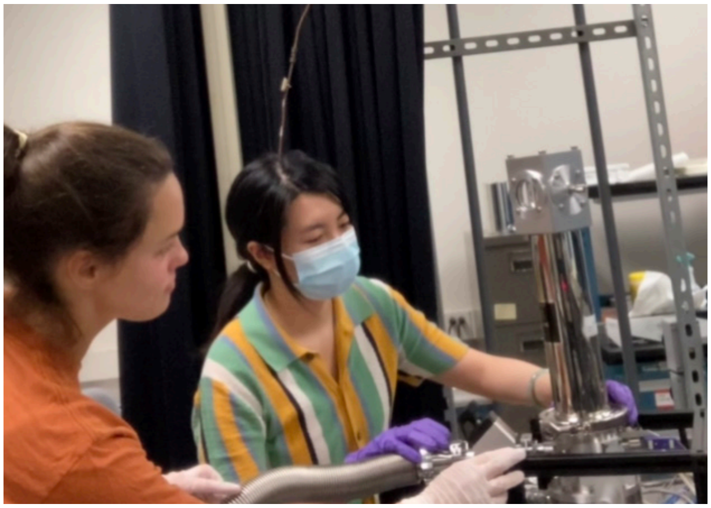
Research Proposal:

Thermal switches based on mechanical actuation or fluids flows are essential components in magnetocaloric and electrocaloric refrigeration cycles and other existing technologies. Efficient solid-state thermal switches can not only enhance the cycling reproducibility of these refrigeration cycles but also enable high-performance phase change memories, thermal camouflage, and other emerging electronic and energy conversion devices. Existing approaches to tunable thermal transport in solids rely either on structural phase transformations or on modification of the scattering rates of energy carriers, typically either phonons or electrons. The switching ratios and speeds of these approaches are insufficient to realize solid-state thermal switches, rheostats, regulators, or transistors that are as effective as their that are as effective as their mechanical or fluid counterparts.

This multidisciplinary research team project investigates new routes to achieve rapid, large, and reversible electronic switching of heat transport in solids and outlines a research program intended to lay the groundwork for practical devices. Building on recent discoveries of topological and collective electronic states, three related approaches are identified to achieve extraordinary electronic switching of thermal transport in bulk crystals, along thin films, and across interfaces. These approaches are based on the chiral anomaly in Weyl semimetals, excitonic heat transport, and resonant Coulomb energy transfer between two-level systems.

This MURI program will investigate these three electronic thermal switching mechanisms as well as approaches to suppress the parasitic phonon thermal transport. Each of the approaches not only leverages cutting-edge research in condensed matter physics to create thermal switches, but also pushes the frontiers of research in condensed matter physics, offering the potential for scientific breakthroughs involving topologically controlled correlated electron and spin physics. In addition, this project identifies four different devices and systems where thermal switches could play critical, enabling roles. Successful realization of high-performance solid-state thermal switching devices would directly impact a range of technologies.

Proposal provided by Li Shi.



Emma Peavler and Qianru (Sally) Jia working on a cryostat, which they use to take measurements of their samples.

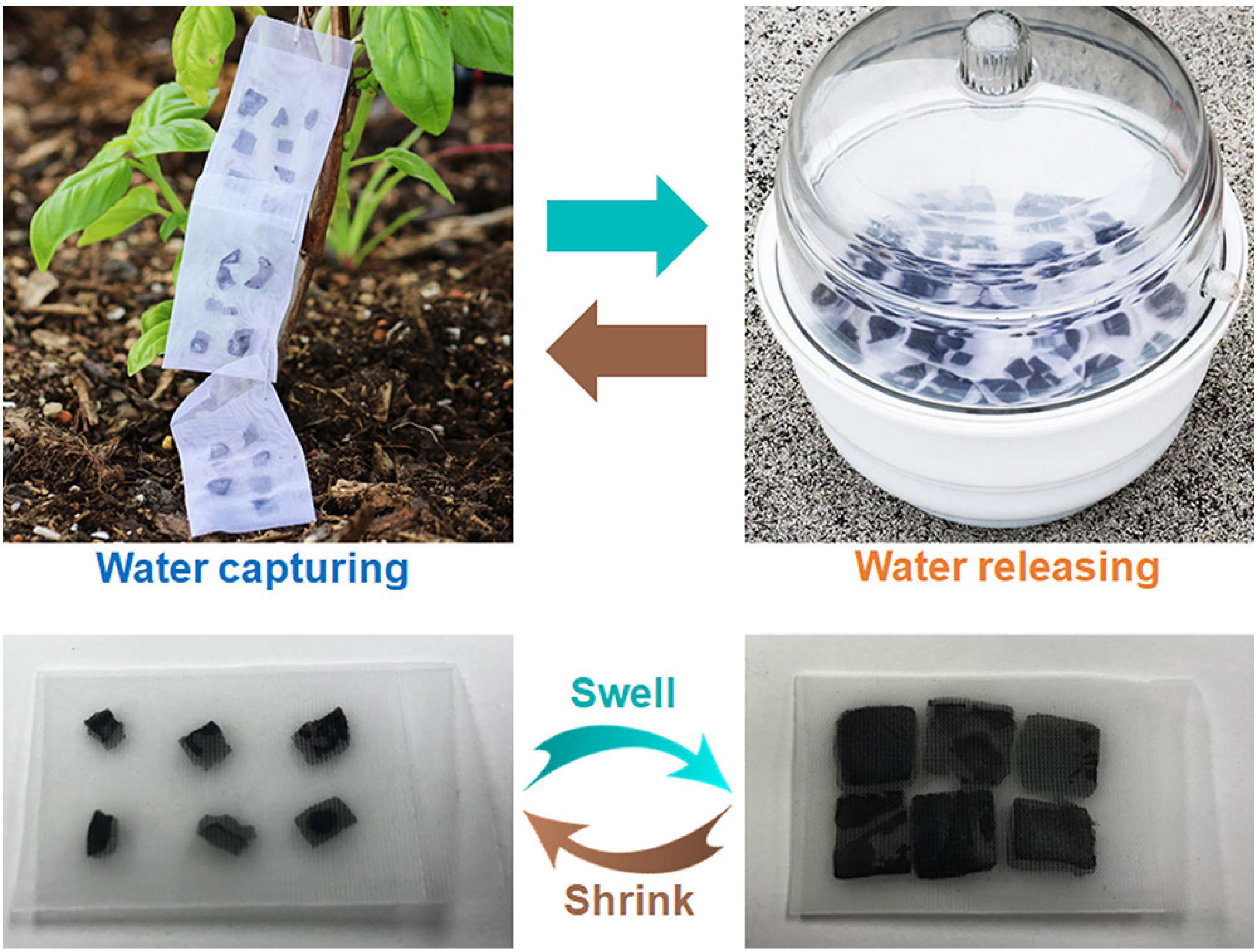
Professor Li Shi faculty photo.

DARPA Grant

We are proud to announce that the U.S. Defense Advanced Research Projects Agency (DARPA) selects Dr. Guihua Yu, TMI faculty member and professor in the Walker Department of Mechanical Engineering, to lead the research as part of its Atmospheric Water Extraction (AWE) program. The UT Austin team led by Prof. Yu includes researchers from Massachusetts Institute of Technology and California Institute of Technology, and was awarded for a total grant of $3.2 million for four years. The goal of the DARPA program is to develop next-generation scalable and advanced sorbent materials and prototypes to capture water from the air and provide enough potable water for the soldiers' daily needs, particularly in arid and hot areas.

"There's an important need for clean drinking water for soldiers especially in extreme environment, and we are excited to be part of this major DARPA program and explore our developed SMAG technology to help solve this problem," Yu said.

Extraction of moisture from the atmosphere to produce clean water has been developed for decades. The traditional method for AWE is to cool the moist air below its dew point by refrigeration and then collect the condensed water, which is an environmental-dependent and energy-intensive process that relies on non-portable fridges. In 2019, Dr. Guihua Yu and his team first



DARPA process infographic.

Professor Guihua Yu faculty photo.

"THERE'S AN IMPORTANT NEED FOR CLEAN DRINKING WATER FOR SOLDIERS, ESPECIALLY IN EXTREME ENVIRONMENTS, AND WE ARE EXCITED TO BE PART OF THIS MAJOR DARPA PROGRAM AND EXPLORE OUR DEVELOPED SMAG TECHNOLOGY TO HELP SOLVE THIS PROBLEM."

- Guihua Yu

demonstrated the super-moisture-absorbent gels (SMAGs) for energy-efficient atmospheric water harvesting. The SMAGs can harvest large amounts of moisture from the ambient environment, convert it to liquid water and quickly release it under solar irradiation. Unlike the commonly used solids sorbents in AWE that need an evaporation-condensation process to collect harvested water, the SMAGs can directly release liquid water upon heating or solar irradiation via liquid-liquid phase separation, offering great advantages in terms of energy efficiency. Since then, they have been working on developing advanced gels for efficient water capturing and releasing. In 2020, the team further demonstrated a novel "self-watering" soil containing SMAGs to help farmers to grow crops even with very limited water and power resources access.

"Our team will explore this grant to develop the next-generation SAMGs that can work under even lower humidity than achieved before," Yu said, "and we believe the research will inspire interesting and important materials science and engineering."

UT Austin team is one of the six research teams in this DARPA program. The other five teams are led by GE Research, Physical Science Inc., Honeywell International, MIT, and the U.S Naval Research Laboratory.

Article by Guihua Yu Research Group.

New Addition to TMI Cleanroom Facility

TMI has recently purchased two thin film deposition tools and a reactive ion etcher as part of the effort to upgrade and replace old instrumentation in the TMI cleanroom located in the Faulkner Nanoscience and Technology building. In particular, TMI acquired the Nano36 thermal evaporator and the PVD75 e-beam and sputtering system from Kurt J. Lesker and the RIE-1C from Samco. The systems were purchased with funds from TMI, the Office of the Vice President for Research, and College of Natural Sciences.

The Nano36 thermal evaporator is equipped with 4 evaporation sources and it is mainly used to deposit thin metallic films. Key advantages of this system compared to the existing thermal evaporators in TMI's cleanroom is that it can deposit films on large substrates with uniformity better than +/-6%. This system is designed to allow the use of square substrates 100mm x 100mm or smaller and round substrates up to 150mm diameter. The system also has higher power which allows deposition of metals with high melting points such as titanium (used for instance as an adhesion layer for gold deposition). The system features a horizontally oriented cylindrical stainless steel chamber body with a spring-loaded, pendulum style, full-access, aluminum front door. The system is pumped using an oil-free mechanical pump and a turbo pump. The base pressure of the system is 7 x 10-8 Torr. The Nano36 evaporator is controlled using KJLC eKLipse™ which provides for automated process control (recipes), if desired. Other features include a source and a substrate shutter, substrate rotation (up to 20 rpm) and two quartz crystals monitors.

The PVD75 is used to deposit metals and oxides by both E-beam and sputtering.

This system offers many capabilities that were not available on any of the existing film deposition systems in TMI's cleanroom. These unique capabilities include water cooled substrate, large area deposition (up to 6 inch wafers) with excellent uniformity, beam stirring for e-beam deposition of oxides, oxides deposition by RF sputtering, and DC sputtering of metals. In addition, because the turbo pump is kept on at all times, low vacuum can be realized fairly fast. For instance, one can achieve pressure in the low 10-6 Torr in one hour. Processes can be also run automatically by using predefined recipes.

The Samco RIE-1C etcher can be used to etch photoresists, metals, and semiconductors. Etchable materials include: silicon dioxide, silicon nitride, silicon oxy-nitride, silicon, poly-Si, polyimide, photoresist, and other polymeric films. The etcher is equipped with four gases: CF_4, O_2, and SF_6 (max flow of 100 sccm). The system features a 6 inch water cooled sample stage and a 13.56 MHz, maximum 200W power supply. The pressure is controlled by the gas flow.

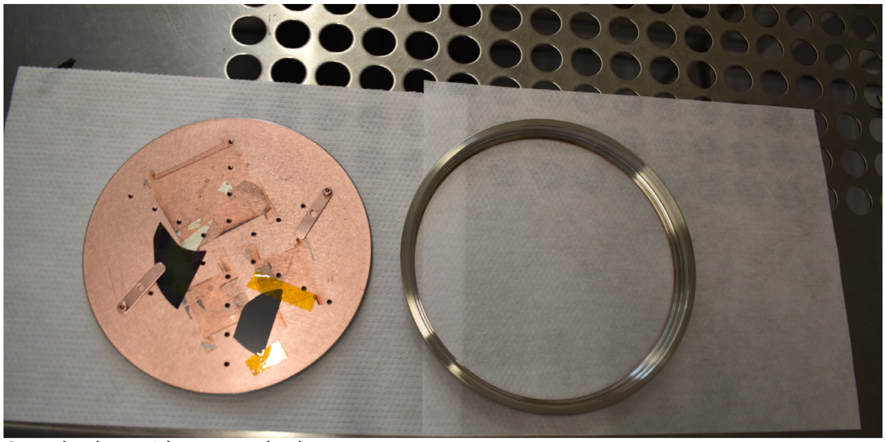
Article by Raluca Gearba-Dolocan, TMI Facility Manager.

Photos of the Nano36 thermal evaporator (left) and PVD75 e-beam and sputtering system (right).

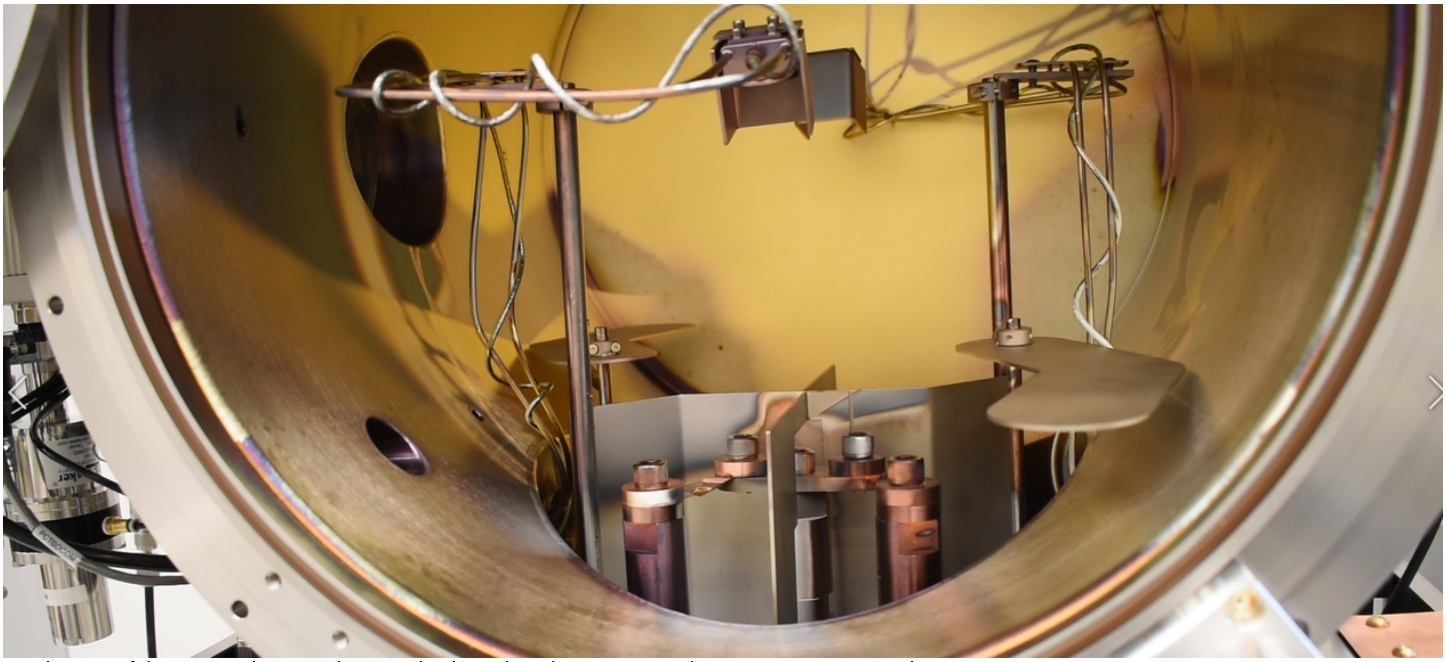
System characteristics:

- 8 pocket e-beam source for 12cc crucibles with shutter. The substrate to source distance is about 15 inches.
- 2 sputtering heads that accept up to 0.375” thick (non-magnetic) targets with a 3” diameter. The throw arm is pretty large, 4 to 6 inches and can be manually adjusted. Tilt capability is also available. Shutters are included to limit cross-contamination. Two process gasses available (0 to 20 sccm): Ar and O2.
- Substrate shutter, substrate rotation (up to 20 rpm).
- Two quartz crystal monitors.
- Uniformity better than 6% over large areas.

Inside view of the PVD75 showing the sample plate, the e-beam source, the sputtering guns, and QCM.



Sample plate with mounted substrates.



Inside view of the PVD75 showing the sample plate, the e-beam source, the sputtering guns, and QCM.

Seminar Series

TMI hosted seven seminars during the Fall 2020 semester under the Goodenough Materials Lecture Series. This series was newly developed in Summer 2020 and we plan to host each fall. In Spring 2021, we hosted nine seminars as part of our annual seminar series.

FALL 2020

Dr. Harry Atwater
California Institute of Technology
New Directions for Energy from Sunlight

Dr. Chad Mirkin
Northwestern University
Mapping the Materials Genome with Megalibraries

Dr. Lynden Archer
Cornell University
Designing Electrolytes and Interphases for Cost-Effective and Safe Storage of Electrical Energy

Dr. Pablo Jarillo-Herrero
Massachusetts Institute of Technology
Magic Angle Graphene: a New Platform for Strongly Correlated Physics

Dr. H.-S. Philip Wong
Stanford University
Materials and Devices for 3D ICs

Dr. Jeff Brinker
University of New Mexico
Synthetic Cellular Constructs based on Silica Cell Replication

SPRING 2021

Dr. Harish Bhaskaran
University of Oxford
Photonics Using Functional Materials for Computing

Dr. Jingguang Chen
Columbia University
Chemical Engineering Approaches for Catalytic Reduction of CO_2

Dr. Laura Gagliardi
University of Chicago
Theoretical and Computational Challenges in Modeling MOF-Supported Catalysts

Dr. Ximin He
University of California, Los Angeles
Bio-like Structural Hydrogels with Life-like Intelligence

Dr. Stephan Hofmann
University of Cambridge
New Device Materials from the Atomic Scale Up: Reflections in 1D and 2D

Dr. Michael Janik
Pennsylvania State University
Development of Electrocatalytic Materials Guided by Computational Chemistry: Fuel Cells and Electrolysis

Dr. Filippo Mangolini
Texas Materials Institute
In Situ Nanoscale Investigations of the Physical Phenomena at Ionic Liquids/Solid Interfaces

Dr. Younan Xia
Georgia Institute of Technology
Toward Controllable and Predictable Synthesis of Colloidal Metal Nanocrystals

Dr. Yuan Yang
Columbia University
Material Characterizations and Designs for Energy Storage and Thermal Management

CONGRATULATIONS TO OUR 2020-2021 GRADUATES!

FALL 2020

Jimi Wang, M.S.
Report: Building Fabrication-Structure-Application Datacubes of 2D Heterostructures
Supervisor: Dr. Deji Akinwande

Qiang Xie, Ph.D.
High-Nickel Layered Oxide Cathodes for High-Performance Lithium-Ion Batteries
Supervisor: Dr. Arumugam Manthiram

SPRING 2021

Nicholas Grundish, Ph.D.
Solid-State and Intercalation Chemistry of Nickel-Tellurate Positive Electrodes for Lithium and Sodium Secondary Batteries
Supervisor: Dr. John B. Goodenough

Abhay Gupta, Ph.D.
Overcoming the Kinetic Limitations of Lithium-Sulfur Batteries
Supervisor: Dr. Arumugam Manthiram

Lezli Matto Gonzalez, M.S.
Thesis: Effect of Electrical Conductivity of Pure and Doped Lanthanum Chromite on the Onset of Selective Laser Flash Sintering
Supervisor: Dr. Desiderio Kovar

Min-Je Park, Ph.D.
Investigation of Solid-State Host Materials for Zn-ion Insertion
Supervisor: Dr. Arumugam Manthiram

Katherine Rader, Ph.D.
Retrogression Forming and Reaging of Two High Strength Aluminum Alloys
Supervisor: Dr. Eric Taleff

SUMMER 2021

Youhong Guo, Ph.D.
Materials Design and Surface Engineering of Functional Hydrogels for Solar Desalination and Water Purification
Supervisor: Dr. Guihua Yu

Brian Heligman, Ph.D.
Design of Composite Foil Anodes for Lithium-ion Batteries
Supervisor: Dr. Arumugam Manthiram

Yun Huang, Ph.D.
Two-Dimensional Materials for Micro/Nanoscale Active Matter
Supervisor: Dr. Donglei (Emma) Fan

Zexi Liang, Ph.D.
Light modulation of Electric Field Driven Semiconductor Micromotors
Supervisor: Dr. Donglei (Emma) Fan

Daniel Sanchez, Ph.D.
The Mechanics and Chemistry of 2D Material Bubbles
Supervisor: Dr. Nanshu Lu

Shyam Sharma, M.S.
Thesis: Towards Low Cost, Environmentally and Socially Responsible Materials for Next- Generation Lithium-Ion Batteries
Supervisor: Dr. Arumugam Manthiram

Xingyi Zhou, Ph.D.
Material Design and Molecular Engineering of Hydrogels for Solar Desalination
Supervisor: Dr. Guihua Yu

Awards and Recognition

STUDENT AWARDS

Amruth Bhargav – Arumugam Manthiram Research Group
- Professional Development Award Summer 2021

Erik Cheng – Gyeong Hwang Research Group
- Professional Development Award Summer 2021

Jie Fang – Yuebing Zheng Research Group
- 2020 Jean Bennett Memorial Student Travel Grant, Optical Society of America
- 2020 OSA Foundation and Incubic/Milton Chang Travel Grant, Optical Society of America
- Professional Development Award Fall 2020
- Professional Development Award Summer 2021

Abhay Gupta – Arumugam Manthiram Research Group
- Dean's Prestigious Fellowship Supplement

Youhong (Nancy) Guo – Guihua Yu Research Group
- MS&E Graduate Student Outstanding Poster Award
- Materials Research Society(MRS) Outstanding Graduate Student Award
- Professional Development Award Fall 2020

Jiaming He – Jianshi Zhou Research Group
- Professional Development Award Spring 2021

Yun Huang – Li Shi Research Group
- Professional Development Award Spring 2021
- Professional Development Award Summer 2021

Youngsun Kim – Yuebing Zheng Research Group
- University Graduate Continuing Fellowship, UT Austin Graduate School
- Professional Development Award Spring 2021

Zixuan Li – Filippo Mangolini Research Group
- Professional Development Award Spring 2021

Zexi Liang – Donglei (Emma) Fan Research Group
-Professional Development Award Spring 2021

Lezli Matto Gonzalez – Desiderio Kovar Research Group
- Dean's Prestigious Fellowship Supplement
- Fulbright Fellowship

Hyungmok Joh – Donglei (Emma) Fan Research Group
- Harris Marcus Award

Seamus Ober – Arumugam Manthiram Research Group
- NSF Fellowship

Daniel Sanchez – Nanshu Lu Research Group
- Graduate Archer Fellowship, UT Austin
- Cullen M. Crain Endowed Scholarship in Engineering
- Point Foundation Grant: The National LGBTQ Scholarship Fund

Kevin Scanlan – Arumugam Manthiram Research Group
- DoD NDSEG Fellowship
- Dean's Prestigious Fellowship Supplement

Kirutiga Srikanda Prabanna Balan – Venkat Subramanian Research Group
- Professional Development Award Summer 2021

Maitri Uppaluri – Venkat Subramanian Research Group
- 2020 ECS PRiME Travel Grant

Colin Yee – Joseph H. Koo Research Group
- First Place, 2021 NSMMS/CRASTE Student Presentations

Xiao Zhang – Guihua Yu Research Group
- 2021, Graduate Continuing Bruton Fellowship, UT Austin Graduate School
- Professional Development Award Spring 2021

Xingyi Zhou – Guihua Yu Research Group
- Professional Development Award Spring 2021

FACULTY AWARDS

Deji Akinwande
- IEEE Fellow, 2020

Vaibhav Bahadur
- Best Paper Runner Up Award, IEEE ITherm 2021

Donglei (Emma) Fan
- Fellow of the Royal Society of Chemistry, 2021

John B. Goodenough
- 2021 Washington Award
- Web of Science Highly Cited Researcher, Chemistry, 2020

Tanya Hutter
- L'Oréal-UNESCO Award for Women in Science

Nanshu Lu
- Web of Science Highly Cited Researcher, Cross-Field, 2020

Allan MacDonald
- Web of Science Highly Cited Researcher, Physics, 2020

David Mitlin
- Web of Science Highly Cited Researcher, Cross-Field, 2020

Filippo Mangolini
- National Science Foundation (NSF) CAREER Award, 2021
- Society of Tribologists and Lubrication Engineers (STLE) 2021 Early Career Award
- Dean's Award for Outstanding Engineering Teaching by an Assistant Professor, 2020
- Teaching Award from the Walker Department of Mechanical Engineering, 2020
- Walker Scholar, Walker Department of Mechanical Engineering, 2020

Arumugam Manthiram
- Electrochemical Society Battery Division Technology Award, 2021
- Fellow of the Academy of Sciences of Chennai, India, 2021
- Web of Science Highly Cited Researcher, Materials Science and Chemistry, 2020

Nicholas Peppas
- American Chemical Society Oesper Award, 2020
- Ellis Island Medal of Honor, 2020
- Elected Member, Korean Academy of Science and Technology, 2020

S.V. Sreenivasan
- Elected to National Academy of Engineering, 2021

Guihua Yu
- Blavatnik National Awards Honoree for Young Scientists, 2021
- Edith and Peter O'Donnell Award in Engineering, Texas Academy of Medicine, Engineering and Science (TAMEST), 2021
- TMS Brimacombe Medalist Award, 2021
- Polymer International-IUPAC Award for Creativity in Applied Polymer Science, 2020
- Outstanding Young Scientist by World Laureates Forum, 2020
- Franklin Award for Outstanding Research, Teaching and Service, 2020
- Web of Science Highly Cited Researcher, Materials Science, 2020

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