A SPECIAL BICENTENNIAL YEAR SYMPOSIUM
&
2ND ANNUAL GRADUATE STUDENT MATERIALS RESEARCH SYMPOSIUM

M@M17
MATERIALS AT MICHIGAN SYMPOSIUM

OCTOBER 16 & 17, 2017 | BOB & BETTY BEYSTER BUILDING | ANN ARBOR, MI, USA
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WELCOME LETTER

Welcome to the special Materials at Michigan (M@M) Symposium being held in the University of Michigan’s Bicentennial Year: 2017. The Symposium celebrates the broad impact of advanced materials research on society, highlighted through a series of keynote lectures from some of the most distinguished materials researchers at University of Michigan. The special event also features talks and posters from selected graduate students from different programs across the University of Michigan campus engaged in advanced materials research.

The interdisciplinary field of materials research seeks to understand and control the basic structure of materials in order to make the products of technology stronger, lighter, brighter, safer, faster and better suited to human needs. Every part in technologies such as computers, electronics, cars, airplanes, electrical power generation, transmission and storage, energy-efficient buildings and devices, biomedical devices, consumer goods and health care, etc., that define the modern life are carefully designed to optimize performance and cost effectiveness.

The field of engineered materials is currently evolving at a more rapid pace than at any point in history and its evolution and societal impact continuously occur through collaborations between materials scientists/engineers and other disciplines such as biology, medicine, physics, chemistry and other areas of engineering and manufacturing.

As we begin University of Michigan’s 3rd century, we look forward to a new era of collaboration on campus that will accelerate the discovery, design, development and deployment of advanced engineering materials to improve the quality of life on our planet.

I thank the interdisciplinary symposium committee and the MSE graduate committee for their effort in planning and organizing this historic event.

Go Blue!

Amit Misra
Professor and Chair,
Department of Materials Science & Engineering
PROGRAM SCHEDULE – PART I
Monday, October 16, 2017

7:45-8:15  Registration & Breakfast

8:15-8:30  Introduction & Welcome
Rachel S. Goldman – Professor of MSE, Physics, and EECS

8:30-8:50  Engineered Materials & Society: A Brief Overview
Amit Misra – Professor and Department Chair, MSE

8:50-9:00  Remarks: Steve Ceccio – Vincent T. and Gloria M. Gorguze Professor and Associate Dean for Research, College of Engineering

9:00-9:45  Engineered Matter: Beyond the Materials Genome
Sharon C. Glotzer – John W. Cahn Distinguished University Professor and Anthony C. Lembke Department Chair, ChemE
Introduced by: Nick Kotov, J. and F.V. Cejka Professor of Engineering

9:45-10:15  Coffee Break

10:15-11:00  Materials for Drug Delivery
Ron Larson – A.H. White Distinguished University Professor, ChemE
Introduced by: Andrej Lenert, Assistant Professor of ChemE

11:00-11:45  Materials for Tissue Engineering
Peter Ma – Richard H. Kingery Collegiate Professor, Dentistry
Introduced by: John Kieffer, Professor of MSE

11:45-12:45  Lunch / Networking

12:45-13:30  Materials for Energy Conversion and Storage
Ted Goodson III – Richard B. Bernstein Collegiate Professor, Chemistry
Introduced by: Bart M. Bartlett, Associate Professor of Chemistry

13:30-14:15  Organic Materials for Optoelectronics
Stephen R. Forrest – Peter A. Franken Distinguished University Professor
Introduced by: Max Shtein, Professor of MSE

14:15-14:45  Coffee Break

14:45-15:30  Materials for Energy Efficient Optoelectronics
Pallab Bhattacharya – Charles M. Vest Distinguished University Professor, EECS
Introduced by: Zetian Mi, Professor of EECS
PROGRAM SCHEDULE – PART II
Monday, October 16, 2017 (cont’d)

15:30-16:15 Ultrafast – Ultrasmall: Nano-materials from Femtosecond Lasers
Roy Clarke – Marcellus L. Wiedenbeck Collegiate Professor of Physics
Introduced by: Becky Peterson, Assistant Professor of EECS

16:15-17:00 Materials for High Temperature Energy Applications
Gary Was – Walter J. Weber, Jr. Professor of NERS
Introduced by: Don Siegel, Associate Professor of ME

Tuesday, October 17, 2017

7:45-8:15 Registration & Breakfast

8:15-8:30 Remarks: S. Jack Hu – J. Reid and Polly Anderson Professor of Manufacturing and Vice President for Research
Introduced by: Rachel S. Goldman, Professor of MSE and Physics

8:30-9:15 Lightweight Materials for Transportation
Alan Taub – Professor of MSE and ME
Introduced by: John W. Halloran, L.H. and F.E. Van Vlack Professor of MSE

9:15-10:00 Laser-Engineered Materials for Transportation and Infrastructure
Jyoti Mazumder – Robert H. Lurie Professor of Engineering
Introduced by: Michael Atzmon, Professor of NERS

10:00-10:45 Integrated Computational Materials Engineering
John Allison – Professor of MSE
Introduced by: Katsuyo Thornton, Professor of MSE

10:45-11:15 Coffee Break

11:15-12:30 Graduate Student Oral Presentations
Session Chair: Anish Tuteja, Associate Professor & Graduate Chair, MSE

12:30-14:15 Lunch and Graduate Student Poster Session

14:15-14:30 Closing Remarks
Sharon C. Glotzer, PhD
*Engineered Matter: Beyond the Materials Genome*

Professor Glotzer, the Anthony C. Lembke Department Chair of Chemical Engineering, received her PhD in Physics from Boston University in 1993. She is the John Werner Cahn Distinguished University Professor of Engineering and the Stuart W. Churchill Collegiate Professor of Chemical Engineering. In addition to Chemical Engineering, she is a professor in Materials Science & Engineering, Physics, and Macromolecular Science & Engineering. Her research group uses computer simulation to discover the fundamental principles of how nanoscale systems of molecular building blocks self-assemble, and to discover how to control the assembly process to engineer new materials. By mimicking biological assembly, they are exploring ways to nano-engineer materials that are self-assembling, self-sensing, self-healing, and self-regulating.

Ronald Larson, PhD
*Materials for Drug Delivery*

Professor Larson received his PhD in Chemical Engineering from the University of Minnesota in 1980. Since 2000, he has been the GG Brown Professor of Chemical Engineering at the University of Michigan, and since 2014 has been the AH White Distinguished University Professor of the University of Michigan. In addition to Chemical Engineering, he is a professor in Mechanical Engineering and Macromolecular Science & Engineering. His research interests include the structure and mechanical properties of viscous or elastic fluids, which include polymers, glasses, colloids, and biological materials. He is also interested in flow and yielding and transport modeling. He wrote a 1998 textbook, “The Structure and Rheology of Complex Fluids.”
**Peter Ma, PhD**  
*Materials for Tissue Engineering*

Professor Ma received his PhD in Polymer Science & Engineering at Rutgers University in 1993. He is the Richard H. Kingery Endowed Collegiate Professor at the University of Michigan. He is a full professor with appointments in Biologic & Materials Sciences at the School of Dentistry Biomedical Engineering, Materials Science & Engineering, and Macromolecular Science & Engineering. His research areas include bio-micro nanotechnology & molecular engineering, bio-nanotechnology, biomaterials, drug delivery & therapeutics, tissue engineering & biomaterials, and regenerative medicine. The research in Ma Lab is highly interdisciplinary and multidisciplinary in nature, spanning through polymer chemistry, polymer physics, polymer processing, biomedical engineering, biotechnology, stem cells and regenerative medicine.

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**Ted Goodson III, PhD**  
*Materials for Energy Conversion and Storage*

Professor Goodson received his PhD in Chemistry at the University of Nebraska-Lincoln. He is the Richard Bernstein Professor of Chemistry at the University of Michigan and also a professor of Macromolecular Science & Engineering. Professor Goodson’s research utilizes a number of spectroscopic techniques towards investigating the optical properties and applications of novel organic macromolecular materials. A major emphasis is placed on the new properties observed in organic macromolecules with branching repeat structures as well as organic macromolecules encapsulated with small metal particles. These materials have been suggested to be candidates for variety of applications involving light emitting devices, artificial light harvesting, strong optical limiters, enhanced nonlinear optical effects, quantum optical effects and as sensors in certain organic and biological devices.
Stephen R. Forrest, PhD

*Organic Materials for Optoelectronics*

Professor Forrest received his PhD in Physics from the University of Michigan in 1979. He is the William Gould Dow Collegiate Professor of Electrical Engineering, Materials Science & Engineering, and Physics. He is also the Peter A. Franken Distinguished University Professor of Engineering and Professor of Electrical Engineering and Computer Science. Professor Forrest’s research focuses on the areas of optics and photonics, quantum science and devices, solid-state devices and nanotechnology, and energy science and engineering. His research interests include organic electronics, photonic integrated circuits, and photonic materials.

Pallab Bhattacharya, PhD

*Materials for Energy Efficient Optoelectronics*

Professor Bhattacharya received his PhD in Electrical Engineering from the University of Sheffield, UK, in 1978. He is the Charles M. Vest Distinguished University Professor of Electrical Engineering and Computer Science and the James R. Mellor Professor of Engineering in the Department of Electrical Engineering and Computer Science at the University of Michigan. His research interests are in the areas of compound semiconductors, low-dimensional quantum confined systems, nanophotonics, spintronics, and optoelectronic integrated circuits. He is currently working on high-speed quantum dot lasers, nitride-based visible quantum dot lasers and LEDs, nanowire heterostructures, cavity quantum electrodynamics and polariton lasers.
Roy Clarke, PhD
_Ultrafast - Ultrasmall: Nano-materials from Femtosecond Lasers_

Professor Clarke received his PhD in Physics from Queen Mary College, University of London, in 1973. He is the Marcellus L. Wiedenbeck Collegiate Professor of Physics and Applied Physics at the University of Michigan. After a stint at the Cavendish Laboratory, University of Cambridge, Dr. Clarke accepted the James Franck Fellowship at the University of Chicago and then joined the faculty of the University of Michigan. He was the founding director of the UM Applied Physics Program, which is now in its 30th year. He is a Fellow of the American Physical Society and in 2012 received a Presidential Award for Excellence in STEM Mentoring. His current research interests focus on the structure and dynamics of thin-film epitaxial materials, including semiconductor quantum dots, magnetic nanostructures and oxide ferroelectrics.

Gary Was, ScD
_Materials for Materials for High Temperature Energy Applications_

Professor Was received his ScD in Nuclear Materials from the Massachusetts Institute of Technology in 1980. He is the Walter J. Weber, Jr. Professor of Sustainable Energy, Environmental & Earth Systems Engineering and holds appointments in Nuclear Engineering & Radiological Sciences and Materials Science & Engineering at the University of Michigan. Professor Was’s research is focused on materials for advanced nuclear energy systems and radiation materials science, including environmental effects on materials, radiation effects, ion beam surface modification of materials and nuclear fuels. He is a Fellow of TMS, the Materials Research Society, ASM International, NACE International and the American Nuclear Society and Editor-in-Chief of the _Journal of Nuclear Materials_.

Alan Taub, PhD

*Lightweight Materials for Transportation*

Professor Taub received his PhD in Applied Physics from Harvard University in 1979. He is a Professor of Materials Science & Engineering at the University of Michigan. In this role, Taub is conducting research in advanced materials and processing and has a leadership role as Chief Technology Officer of the manufacturing innovation institute LIFT (Lightweight Innovations For Tomorrow). Taub was previously Vice President, Global Research & Development, for GM’s advanced technical work activity, seven science laboratories around the world, and seven global science offices.

Jyoti Mazumder, PhD

*Laser-Engineered Materials for Transportation and Infrastructure*

Professor Mazumder received his PhD in Process Metallurgy in 1978 from Imperial College. He is the Robert H. Lurie Professor of Mechanical Engineering, the Director for the Center for Laser-Aided Intelligent Manufacturing, and the Director for the NSF I/UCRC for Lasers and Plasmas for Advanced Manufacturing at the University of Michigan. His research interests include transforming the field of materials processing by laser from a technological art to scientifically based engineering; laser aided manufacturing; atom to application; technical approach including on-line optical diagnostics, transport phenomena modeling, non-equilibrium synthesis of materials with tailored properties, and their evaluation and characterization.
John Allison, PhD

Integrated Computational Materials Engineering

Professor Allison received his PhD in Metallurgical Engineering from Carnegie-Mellon University in 1982. His major research interest is in understanding the inter-relationships between processing, alloying, microstructure and properties in metallic materials – and in incorporating this knowledge into computational tools for use in research, education and engineering. An important part of his research is development of Integrated Computational Materials Engineering (ICME) tools – and thus collaborations with other computational and experimental groups are an essential element of his work. Central to his research are investigations on the evolution of microstructures - current examples include precipitate evolution, recrystallization and grain growth and texture development in magnesium, aluminum and titanium alloys.

M@M17 Symposium Organizing Committee Members:

R.S. Goldman (Materials Science & Engineering)
M. Atzmon (Nuclear Engineering & Radiological Sciences)
B.M. Bartlett (Chemistry)
J.W. Halloran (Materials Science & Engineering)
J. Kieffer (Materials Science & Engineering)
C. Kurdak (Physics)
A. Lenert (Chemical Engineering)
E.A. Marquis (Materials Science & Engineering)
R.L. Peterson (Electrical Engineering & Computer Science)
D. Siegel (Mechanical Engineering)
M.D. Thouless (Mechanical Engineering)
~ Oral Presentation by Mathew Boban ~

Designing Self-Healing Superhydrophobic Surfaces with Exceptional Mechanical Durability

M. Boban, K. Golovin, J. M. Mabry, and A. Tuteja

Water beads up and effortlessly rolls off a superhydrophobic surface (SHS) due to its combination of low surface energy and texture. This capability of SHSs has earned increasing interest in the past decade, particularly for its applications in drag reduction, stain repellency, self-cleaning, fog harvesting, or heat transfer (to name a few). The durability of an SHS is critical in all of these applications. Although a handful of purportedly durable SHSs have been reported, there are still no criteria available for systematically designing a durable SHS. In the first part of this work, we discuss two new design parameters that can be used to develop mechanically durable SHSs. These parameters aid in the rational selection of material components, and allow one to predict the capillary resistance to wetting of any SHS from a simple topographical analysis. However, even the most durable SHSs can eventually become damaged, and ideally should be able to recover. In the second part, we utilize our design parameters to guide the fabrication physically and chemically self-healing SHSs via spray deposition of blends of polymers and hydrophobic small molecules. The developed surfaces can recover their superhydrophobicity even after being abraded, scratched, burned, plasma-cleaned, flattened, sonicated, and chemically attacked.

Figure: Droplets of dyed water placed on a durable superhydrophobic surface. The left-hand side of the coating has been significantly abraded but remains water-repellent.
Large-scale Flexible Transparent Electrodes Using High-performance Doped Silver Films

C. Ji and L. J. Guo

Transparent electrodes are key components in various applications including displays, light-emitting diodes, solar cells, and smart windows. In addition to high conductivity and optical transparency, novel transparent conductors that possess excellent flexibility and can be processed at room temperature are highly demanded in next-generation display technologies.

In this presentation, a new kind of silver film: copper-doped silver is discovered and its properties are studied. The film is ultra-thin, ultra-smooth, low loss, long-term stable, and can be easily achieved at room-temperature. It features lower fabrication cost, better conductivity, and higher mechanical flexibility over traditional indium tin oxide (ITO) counterparts, thus facilitating high-performance flexible displays and optoelectronic devices, such as organic solar cells, hyperbolic metamaterials, plasmonic waveguides, etc. Transparent electrodes based on this novel material have been mass-produced via the roll-to-roll sputtering method with a high yield and we are preparing for a startup with the new technology.

Figure: An ultra-thin, smooth, and low-loss Cu doped Ag by co-sputtering and its mass-production for flexible transparent electrodes.
Unveiling the Intercalation Mechanism in Core-Shell Cathode Particles for Rechargeable Lithium Batteries

S. Kazemiabnavi, R. Malik, B. Orvananos, A. Abdellahi, K. Thornton and G. Ceder

Developing new cathode materials for rechargeable batteries with enhanced electrochemical performance, low cost, and improved cycle life is critically important in achieving the requirements for large-scale energy storage applications. Surface modification of active cathode particles through nanoscale coating is commonly used as a strategy to improve capacity retention, rate capability, and thermal stability of the cathode material. The encapsulating phases on cathode particles have also been observed as a surface phase forming unintentionally during the charge/discharge cycles. In this study, we developed a general continuum-scale model to simulate the galvanostatic charge/discharge of a cathode particle with core-shell heterostructure. The model dual-active-material particle is comprised of a core material encapsulated by a thin layer of a second phase. We studied the effect of the open-circuit voltage of active materials, Li diffusivity inside the particle, and the particle geometry on the kinetics of Li intercalation. We analyzed the galvanostatic charge/discharge profiles and the Li concentration evolution inside the particles at different loading conditions to determine a design criteria that ensures optimal electrochemical performance in core-shell hybrid cathode materials. Our findings provide critical guidance in material selection when designing high-capacity cathodes for rechargeable batteries.

Figure: Computational model of intercalation process in core-shell cathode particles for rechargeable batteries. The 1-D model system and charge/discharge profiles for a spherical particle are shown on top. The extended 3-D model allows for simulating the intercalation process in core-shell cathode particles with complex geometries.
~ Oral Presentation by Alan Olvera ~

Partial Indium Solubility Induces Chemical Stability and Colossal Thermoelectric Figure of Merit in Cu$_2$Se


High thermoelectric figure of merit, \( ZT \sim 2.1 \) at 1000 K, have been reported in Cu$_{2-x}$Se-based materials. However, their deployments in operational devices have been hampered by chemical instability and low average ZT (\( ZT_{\text{ave}} \)) values. Here, we demonstrate improved chemical stability and a record high \( ZT_{\text{ave}} \sim 1.5 \) over a broad temperature range (\( T \leq 850 \) K) in Cu$_2$Se/CuInSe$_2$ nanocomposites, with ZT values ranging from 0.6 at 450 K to an unprecedentedly large value of 2.6 at 850 K for the sample with 1 mol% In. This remarkable performance is attributed to the localization of Cu$^+$ ions induced by the incorporation of In into the Cu$_2$Se lattice, which simultaneously boost the electrical conductivity and reduce the thermal conductivity of the nanocomposites. These findings pave the way for large-scale utilization of Cu$_2$Se-based materials in thermoelectric generators.

\textbf{Figure:} (A) Schematic illustration of the atomic structure of Cu$_2$Se/CuInSe$_2$ (CS/CIS) composites showing a nanocrystal of CIS coherently embedded in the CS matrix. Such coherent interfaces assist in carrier transport across the interface, while inhibiting diffusion of copper ions owing to the degree of Cu disorder between CS and CIS. SEM images of the surfaces of (B) pure Cu$_2$Se and (C) 1% indium-doped Cu$_2$Se after an accelerated electromigration study, showing the suppressing action of indium on copper ion diffusion when high current densities are applied to the bulk materials. Large agglomerations of copper are seen in pure Cu$_2$Se, which is not the case for the indium-doped material.
Fundamentals and Applications of Organic-Inorganic Hybrid Semiconductors

A. Panda and S. Forrest

In this work we will discuss the fundamental physics and potential applications for a new class of heterogeneous semiconductors known as organic-inorganic hybrid semiconductors. Since many interesting charge transport and energy transfer phenomenon in semiconductors are determined by their interfacial properties, we will develop a theory for behavior of charges and excitons at hybrid organic-inorganic semiconductor heterojunctions (OI-HJs). We will describe a new excitonic state that exists at the OI-HJs, known as the hybrid charge transfer exciton (HCTE), and demonstrate our ability to manipulate its properties by tuning the dimensionality of the semiconductor material systems. Match between experimental data and a first-principles quantum mechanical description of the HCTE will be discussed. We will also present current density vs. voltage data for OI-HJ based diodes, which have application in the next generation of solar-cells, as a function temperature and voltage, and show that the data fit with the predictions of our theory. We will conclude by discussing potential applications for the HCTE and future pathways for development of the nascent field of organic-inorganic hybrid semiconductors.

Figure: Charge density distribution of an electron in the inorganic semiconductor when coulombically bound to a hole in the organic semiconductor. Study of quantum confinement of the hybrid charge transfer exciton (HCTE) at organic-inorganic semiconductor heterojunctions has the potential to unravel new physics and applications for hybrid semiconductor material systems.
1. **Saurabh Acharya**, Electrical and Computer Engineering  
   Research Advisor: Stephen Maldonado and Jamie D. Phillips  
   Title: *Characterization of Self-Doping in Ge Microwires Grown by Electrochemical Liquid-Liquid-Solid (ec-LLS)*

2. **Jacob Adams**, Materials Science and Engineering  
   Research Advisor: John Allison  
   Title: *Microstructural effects on the short crack growth behavior of WE43 magnesium*

3. **Carl Simon Adorf**, Chemical Engineering  
   Research Advisor: Sharon C. Glotzer  
   Title: *Materials Data Management with signac*

4. **Shantonio Birch**, Mechanical Engineering  
   Research Advisor: Kevin Pipe  
   Title: *Strain-Induced Reduction in Dynamic Lattice Disorder in Small Molecular Organic Semiconductors*

5. **Tobias Burger**, Chemical Engineering  
   Research Advisor: Andrej Lenert  
   Title: *Absorptive Spectral Control for High Efficiency Thin Film Thermophotovoltaics*

6. **Kuan-Hung Chen**, Materials Science & Engineering  
   Research Advisor: Neil Dasgupta  
   Title: *Dead Lithium: Mass Transport Effects on Voltage, Capacity, and Failure of Lithium Metal Anodes*

7. **Ted Cui**, Materials Science & Engineering  
   Research Advisor: Amit Misra  
   *Achieving High Strength and Good Deformability in Cu/Mo Nanocomposites*
Graduate Posters (cont'd)

8. **Davide Del Gaudio**, Materials Science & Engineering  
   Research Advisor: Rachel S. Goldman and John Heron  
   Title: *Pulsed laser deposition of In2O3-SnO2: from films to nano-wires*  
   
9. **Benjamin Derby**, Materials Science & Engineering  
   Research Advisor: Amit Misra  
   Title: *3D Nano-metallic Thin Films by Design*  

10. **Insung Han**, Materials Science & Engineering  
    Research Advisor: Ashwin Shahani  
    Title: *Probing the growth and melting pathways of a decagonal quasicrystal in real-time*  

11. **Nathaniel Hardin**, Chemistry  
    Research Advisor: Ayyalusamy Rammamorthy  
    Title: *Synthesis and of pH tunable nanodiscs*  

12. **Zhihua Huang**, Materials Science & Engineering  
    Research Advisor: Amit Misra and John Allison  
    Title: *Interaction of Glide Dislocations with Extended Precipitates in Mg-Nd alloys*  

13. **Zumrad Kabilova**, Electrical and Computer Engineering  
    Research Advisor: Becky Peterson  
    Title: *Charge transport in highly doped (010) Î2-Ga2O3 single crystals made by edge-defined film-fed growth*  

14. **Allison Kelly**, Chemistry  
    Research Advisor: Paul Zimmerman  
    Title: *Mechanochemical Reaction Path Finding with the Growing String Method*  

15. **Hannah Kim**, Chemical Engineering  
    Research Advisor: Andrej Lenert  
    Title: *Nanoporous thermal filters for high-performance sub-ambient radiative cooling*
Graduate Posters (cont’d)

16. Mitchell Lancaster, Chemistry
   Research Advisor: Stephen Maldonado
   Title: Measurement of Charge Transfer Kinetics and Energetics at Recessed n-Si Ultramicroelectrode/Electrolyte Contacts

17. Tianjiao Lei, Materials Science & Engineering
    Research Advisor: Michael Atzmon
    Title: Relationship between STZ properties, beta relaxation and ductility of metallic glasses

18. William LePage, Mechanical Engineering
    Research Advisor: Samantha Daly and John Shaw
    Title: The Influence of Phase Transformation on Shape Memory Alloy Fatigue and Fracture

19. Chen Li, Mechanical Engineering
    Research Advisor: Kevin Pipe
    Title: High thermal conductivity in electrostatically engineered polymers

20. Albert Liu, Applied Physics
    Research Advisor: Steven Cundiff
    Title: Coherence Transfer in CdSe Colloidal Quantum Dots Revealed by 2D Spectroscopy

21. Tianyu Liu, Macromolecular Science and Engineering
    Research Advisor: Michael Solomon
    Title: Spectral Response of Colloidal Crystals and its Relationship to Crystal Properties

22. Juan Lopez, Materials Science & Engineering
    Research Advisor: Pierre F. Poudeu
    Title: Probing the origin of magnetism in FeSb2-xBixSe4 ferromagnetic semiconductors
Graduate Posters (cont’d)

23. **Hongling Lu**, Materials Science and Engineering  
   Research Advisor: Rachel S. Goldman  
   Title: *Mechanisms for Ga(B)N Film to Nanowire Transitions During Molecular Beam*

   Research Advisor: Pierre F. Poudeu  
   Title: *Thermoelectric and magnetic properties of nanostructured n-type Ti0.25Zr0.25Hf0.5(Ni,Fex)Sn0.975Sb0.025 half-Heusler alloys*

25. **Hannah Masten**, Electrical Engineering & Computer Science  
   Research Advisor: Rebecca Peterson and Jamie Phillips  
   Title: *Photo-assisted Capacitance-Voltage Characterization of Interface States in Si02/I2-Ga2O3 (010) MOS Capacitors*

26. **Peter Meisenheimer**, Materials Science & Engineering  
   Research Advisor: John Heron  
   Title: *Long Range Magnetic Order and Disorder Driven Enhancement of Magnetic Phenomena in Entropy Stabilized Oxides*

27. **Kelsey Mengle**, Materials Science and Engineering  
   Research Advisor: Manos Kioupakis  
   Title: *Near-Edge Optical and Phonon Properties of B-Ga2O3*

28. **Saman Moniri**, Chemical Engineering  
   Research Advisor: Ashwin Shahani  
   Title: *Integrated Imaging of Self-Organized Modified Eutectics*

29. **Aeriel Murphy**, Materials Science & Engineering  
   Research Advisor: John Allison  
   Title: *The Recrystallization Behavior of Unalloyed Mg and a Mg-Al Alloy*

30. **Jordan Occena**, Materials Science & Engineering  
   Research Advisor: Rachel S. Goldman  
   Title: *Influence of surface reconstruction on GaAsNBi alloy formation*
Graduate Posters (cont’d)

    Research Advisor: Sharon C. Glotzer  
    Title: *Digital Alchemy for Materials Design*

32. **Ali Salehi**, Chemical Engineering  
    Research Advisor: Ronald G. Larson  
    Title: *Spatiotemporal Evolution of Layer-by-Layer Assembled Oppositely Charged Polyelectrolyte Multilayer Thin Films*

33. **Catherine Snyder**, Materials Science & Engineering  
    Research Advisor: Anish Tuteja and Geeta Mehta  
    Title: *Systematic nanoparticle drug delivery analysis in high-grade serous ovarian cancer*

34. **Youngbae Son**, Electrical Engineering  
    Research Advisor: Becky Peterson  
    Title: *Spin-coated zinc tin oxide film made via metal-organic decomposition route*

35. **Benjamin Swerdlow**, Materials Science and Engineering  
    Research Advisor: Sharon C. Glotzer  
    Title: *Designing DNA-Functionalized Nanoparticle Binary Assemblies*

36. **Mohsen Taheri Andani**, Materials Science & Engineering  
    Research Advisor: Jun Ni and Amit Misra  
    Title: *Micromechanics-based Modeling of additively manufactured metallic parts*

37. **Emine Turali-Emre**, Biomedical Engineering  
    Research Advisor: Nicholas A. Kotov  
    Title: *Iron Sulfide Supraparticles as Artificial Viruses for Gene and Gene Editing Therapies*

38. **Bryan VanSaders**, Materials Science & Engineering  
    Research Advisor: Sharon C. Glotzer  
    Title: *Local Control of Dislocations in Colloidal Materials*
Graduate Posters (cont’d)

39. Dandan Wang, Materials Science & Engineering  
   Research Advisor: Professor Michael Thouless  
   Title: *Mechanisms of abrasion in nonwovens and strategies for abrasion resilient nonwovens*

40. Michael Wang, Materials Science & Engineering  
   Research Advisor: Jeff Sakamoto  
   Title: *Correlating the Interface Resistance and Surface Adhesion of the Li Metal-Solid Electrolyte Interface*

41. William Wang, Biomedical Engineering  
   Research Advisor: Brendon Baker  
   Title: *Matrix elasticity defines cell migration modes in aligned fibrous microenvironments*

42. Jill Wenderott, Materials Science & Engineering  
   Research Advisor: Peter Green  
   Title: *Electronic properties at the polymer/conductor interface: effect of polymer morphology*

43. Ren Wiscons, Chemistry  
   Research Advisor: Adam Matzger  
   Title: *Ternary Charge-Transfer Solid Solutions: A method for achieving continuous optoelectronic tunability*

44. Richard Youngblood, Biomedical Engineering  
   Research Advisor: Lonnie Shea  
   Title: *Developing A 3D Niche Microenvironment To Improve Stem Cell-Derived Î2-Cell Maturation For Treatment of Type 1 Diabetes*
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