

2023 Joint Review for Materials with Extreme Properties and Condensed Matter Physics

Drs. Ali Sayir/Jiwei Lu | May 8-12, 2023 | Arlington, VA (hybrid)

Basic Research Innovation Collaboration Center (BRICC)
4100 N Fairfax Drive, Suite 450 | Arlington, VA 22203

Agenda Day 1 | Monday, May 8, 2023

Long talks: 20-minute presentation + 10 minute Questions and discussion

Short talks: 10-minute presentation + 5 minute Questions and discussion

Time	Topic	Speaker
8:00	Check In / Login	
8:30	Welcome remarks	Van Blackwood, Rt Tech Advisor
8:45	Design and optimization of synthesizable materials with targeted quantum characteristics	Giulia Galli, University of Chicago
9:00	Continuum/Lattice Strain Effects in SiC-NV Crystals	Huseyin Sehitoglu, University of Illinois
9:15	Optically Active Semiconductor Spin Qubits with Long Coherence Times Using Single Donor Impurities in ZnSe	Edo Waks, University of Maryland
9:30	Search for deep center defects for quantum applications in ZnSe	Douglas Irving, North Carolina State University
10:00	BREAK	
10:30	Optical imaging of magnetic quantum phase transitions in 2D materials	Kin Fai Mak, Cornell University
10:45	Topological Quantum Electronics and Optoelectronics in Moire Superlattices	Qiong Ma, Boston College
11:00	Tunable phases in charge-density-wave heteroepitaxial devices	Joseph Falson, California Institute of Technology
11:15	Enhancing Topology with Twistronics	Jennifer Cano, Stony Brook University
11:30	High Temperature, Scalable Flat Bands	Joseph Checkelsky, Massachusetts Institute of Technology
12:00	LUNCH	
1:30	Strongly Correlated Electrons for Topological Quantum Phases with Amplified Responses	Qimiao Si, Rice University
2:00	Unusual physics in Dirac-Weyl materials with a flat band	Ying-Cheng Lai, Arizona State University
2:15	Quantum Magnetotransport in Two-Dimensional Quartic Materials	Haldun Sevincli, Izmir Yuksek Teknoloji Enstitusu
2:30	Topological superconductivity and induced phase transitions in strained Heusler membranes and twisted bilayers	Jason Kawasaki, University of Wisconsin
2:45	Correlated orbital control of electronics, magnetism, and topological behavior in rhenates	Charles Ahn, Yale University

3:00	BREAK	
3:30	Effects of disorder on electronic properties near nematic quantum phase transitions: model systems to explore fundamental physics relevant to the discovery of new superconducting phases	Ian Fisher, Stanford University
4:00	Exotic Electronic Quantum Matter: Multipolar Order, Bogoliubov Fermi Surfaces, and Flat Bands	Rafael Fernandes, University of Minnesota
4:15	Functional Nanostructured Strongly Correlated Solids	Ivan Schuller, University of California, San Diego
4:30	Wavelet-enhanced quantum sensing with solid-state nuclear spins...	Ceyhun Bulutay, Ihsan Dogramaci Bilkent Universitesi
4:45	Materials Science for Local Heating of Electronic Nanostructures	Bethanie Stadler, University of Minnesota
5:00	Microstructural design of light-induced phase transformation materials	Ananya Balakrishna, University of Southern California
5:10	MEETING ADJOURN	

Agenda Day 2 Tuesday, May 9, 2023		
Long talks: 20-minute presentation + 10 minute Questions and discussion Short talks: 10-minute presentation + 5 minute Questions and discussion		
Time	Topic	Speaker
8:00	Check In / Login	
8:30	Exploring Correlated Topological States with Charge Density Waves	Kenneth Burch/Leslie Schoop, Boston College/Princeton
8:45	Exploring Entanglement in Quantum Spin Liquids with Nonlinear Spectroscopy	John Harter, University of California, Santa Barbara
9:00	Unconventional Topological Fermions	Emilia Morosan/Ming Yi Rice University
9:15	Assessment of Dislocation Interaction Processes with Grain Boundaries by Nonlinear Optical Spectroscopy	Steve Greenbaum, The City University of New York
9:30	Dislocations as nature's quantum wires	Maryam Ghazisaeidi, Ohio State University
10:00	BREAK	
10:30	In situ nanoscale visualization of peritectic reactions	Ashwin Shahani, University of Michigan
10:45	UNDOPhase: UNCertainty-DOMinated Phase Transitions in Magnetic Materials	Pinar Acar, Virginia Polytechnic
11:00	Advancing graph models for quantification of transparent ceramic microstructures	Veera Sundararaghavan, University of Michigan
11:15	Ion Channels in Geopolymers: Artificial Synapses with Unique Electro-mechanical Properties	Caterina Lamuta, University of Iowa

11:30	Time reversal symmetry breaking in quantum materials without magnetism	Oliver Monti, University of Arizona
12:00	LUNCH	
1:30	Parity time-symmetry breaking in biological active matter	Aşkin Kocabaş, Koc Universitesi
2:00	Discovery and Exploration of Quantum Nitrides	James Rondinelli/Stephen Wilson, Northwestern University/UCSB
2:15	Unraveling phonons at the atomic scale - a new tool to explore the science of thermal transport	James Lebeau, Massachusetts Institute of Technology
2:30	Effect of Extreme Electric Fields on Thermal Transport in Wide-gap Semiconductors	Bolin Liao, University of California, Santa Barbara
2:45	Extreme Nonlinearity in Transition Metal Oxides	Alexander Demkov, University of Texas At Austin
3:00	BREAK	
3:30	Picocavity QED: A New Materials Platform for Room-Temperature Control of Quantum Coherence	Markus Raschke, University of Colorado
4:00	New Paradigms for Goniopolar Materials	Joshua Goldberger, Ohio State University
4:15	Strongly correlated electronic structure in large alkali oxocobaltates	Walter Lambrecht, Case Western Reserve University
4:30	UV Photostimulation Effects on Semiconductor Defects and Transport	Elif Ertekin, University of Illinois
5:00	MEETING ADJOURN	

Agenda Day 3 Wednesday, May 10, 2023		
Long talks: 20-minute presentation + 10 minute Questions and discussion Short talks: 10-minute presentation + 5 minute Questions and discussion		
Time	Topic	Speaker
8:00	Check In / Login	
8:30	Measurement - Only Quantum Bits with Bulk Nonabelian Anyons on Graphene	Andrea Young, University of California Santa Barbara
8:45	Nonlinear Infrared Light-Matter Interactions of Topological Quantum Material	Li Yang, Washington University
9:00	Engineering Superconductivity in Germanium	Javad Shabani, New York University
9:15	Effect of Strain on Surface Electronic Properties of MXenes	Mehmet Baykara, University of California, Merced
9:30	Permittivity Gradients, Polarization, and Gas Dynamics in Composite Electromagnetic Heat Exchangers	Burt Tilley, Worcester Polytechnic Inst
9:45	Novel properties and topological phases in strongly correlated pyrochlore systems	Liang Wu, University of Pennsylvania

10:00	BREAK	
10:30	Magnetic-Free Nonreciprocal Photonic Structures	Andrey Chabanov, University of Texas at San Antonio
10:45	Direct visualization of topological superconducting states in the GHz regime	Monica Allen, University of California, San Diego
11:00	Nanoscale Quantum Sensing and Imaging of Emergent Spin Behavior in an Antiferromagnetic Insulator	Chunhui Du, University of California, San Diego
11:15	Quantification of Atom Probe Tomography Data	Wolfgang Windl, Ohio State University
11:30	Two-dimensional molecular crystals for hybrid quantum solids	Jiwoong Park, University of Chicago
12:00	LUNCH	
1:30	Topological Flat Bands for Correlated Electron Systems (TOPFORCE)	Susanne Stemmer, University of California, Santa Barbara
2:00	Ferroelectric Creation and Manipulation of Novel Topological States in 2D Heterostructures	Cheng Gong/ Igor Zutic, University of Maryland/University at Buffalo
2:15	New Magnetic Interfaces for Quantum Phenomena	Abhay Pasupathy, Columbia University
2:30	Quantum Spin Dynamics, Coherence, and Disorder in Dense Magnetic Systems	Daniel Silevitch, California Institute of Technology
2:45	Correlated Phenomena in Layered Materials for Next-Generation Photonics and Microelectronics	Rahul Rao, AFRL/RX
3:00	BREAK	
3:30	Emergent Phenomena in Coupled Systems Driven by Acoustic Waves	Michael Newburger, AFRL/RX
4:00	Unraveling the Multi-Scale Structure-Performance Correlation of Temperature Stable Relaxors at Extreme Conditions	Volkan Ortalan, University of Connecticut
4:15	Metallic Glass/Nanocrystal Composites and NiTiHf Shape Memory Alloys for High Temperature Applications	Benat Kockar, Hacettepe University
4:30	Growth and Characterization of Gallium-Oxide Epitaxial Films for High Performance Contact Structures	Chintalapalle Ramana, University of Texas At El Paso
4:45	Chemical Vapor Deposition System for Research on Gallium-Oxide and Related Semiconductors	Lisa Porter, Carnegie Mellon University
5:00	MEETING ADJOURN	
5:30	NO-HOST NETWORKING (LOCATION: TBD)	

Agenda Day 4 | Thursday, May 11, 2023

Long talks: 20-minute presentation + 10 minute Questions and discussion

Short talks: 10-minute presentation + 5 minute Questions and discussion

Time	Topic	Speaker
8:00	Check In / Login	
8:30	Wigner Crystals in Atomically Thin Heterostructures	Hongkun Park, Harvard University
8:45	AFRL-Cornell Center for Epitaxial Solutions (ACCESS)	Michael Thompson, Cornell University
9:00	Fundamental Study of p-Type Doping in MOCVD-Grown Ga ₂ O ₃	Manijeh Razeghi, Northwestern University
9:15	Terahertz Electron Paramagnetic Resonance Ellipsometry defect characterization in ultrawideband gap monoclinic gallium oxide and related alloys	Mathias Schubert, University of Nebraska
9:30	Semiconducting AlN: A New Pathway to High Voltage, Power and Temperature Ultra-Wide Bandgap Power Electronic Components	William Doolittle, Georgia Tech
10:00	BREAK	
10:30	Exploring optical cavities based on gallium oxide nanomaterials	Bianchi Mendez, Complutense University of Madrid
10:45	Electromagnetically induced modification of metal optical properties	Matthew Berg, Kansas State University
11:00	Millimeter Wave Interactions with High Temperature Materials	Zane Cohick, AFRL/RD
11:15	Short Range Order and Electronic Entropy: from Melts to Solids	Antoine Allanore, Massachusetts Institute of Technology
11:30	Ferroelectric control of conductivity in beta-Ga ₂ O ₃ for power electronics	Nicholas Barrett, Commissariat L'energie Atomique
12:00	LUNCH	
1:30	Novel Materials and Nanostructures for use in High-Power Electromagnetic Systems	Tyson Back, AFRL/RX
1:45	Window Development Tools for Hypersonic Applications	Randall Hay, AFRL
2:00	Towards Dissipation-less Conduction in Oxide Topological Insulators	Yuri Suzuki, Stanford University
2:15	BREAK	
2:45 10 min each talk	Extreme limits of diatom-enabled two-phase thermal management	Lenan Zhang, Massachusetts Institute of Technology
	Operando studies of atomically precise materials	Ritesh Agarwal, University of Pennsylvania
	Supercritical Phase Transformations for Multiferroic Materials	Ashley Bucsek, University of Michigan
	Topological vortex structure and piezoelectric enhancements in low dimensional ferroelectrics	Fohtung Edwin, Rensselaer Polytechnic Institute
	Unraveling ultrafast magnetization dynamics of nanoscale magnetic textures	Roopali Kukreja, University of California, Davis

	High-temperature infrared nanoceramics for hypersonic applications	Lucas Pierre, University of Arizona
	Ultra-low oxygen activity environment for metastable oxide phase synthesis	Shriram Ramanathan, Rutgers University
	Spin Entropy in Strain-Tuned Rashba Semiconductors	Jian Shi, Rensselaer Polytechnic Institute
	Spin Configuration, Chemical Reactions, and Synthesis under EM Field	Daryoosh Vashaee, North Carolina State University
	Exploration of novel ultrawide-band-gap heterovalent ternary oxide ligao2 for extreme environment	Hongping Zhao, Ohio State University
4:30	Discovering new atomically laminated transition metal borides with diverse properties	Deniz Cakir, University of North Dakota
5:00	MEETING ADJOURN	

Agenda Day 5 Friday, May 12, 2023		
Time	Topic	Speaker
9:00	One-on-One Meetings with POs	
12:00	MEETING ADJOURN	