



# 2020 AFOSR/NSF Program Review on Materials in Extreme Properties

Drs. Ali Sayir / Alexis Lewis | October 13-16 & 26-29, 2020 | Virtual



## Tuesday, Agenda Day 1 | October 13, 2020

Time	Topic	Speaker
9:00	<b>ZOOM LOGIN</b>	
9:15	WELCOMING REMARKS	A. Lewis & A. Sayir
<b>PREDICTIVE MATERIAL SCIENCE: NSF &amp; AFOSR PART I - QUANTITATIVE REPRESENTATION OF MICROSTRUCTURE (QRM)</b>		
9:30	QRM 18 Microstructural Quantification and Virtual Reconstruction	M. Maiaru U MASS LOWELL
10:00	QRM 18 Visual Info to Quantify Microstructure-Processing Relationship	E. Holm & B. Webler CMU
10:30	<b>BREAK</b>	
11:00	QRM 18 Hybrid Adversarial-Training Methods for 3D Microstructures	S. Niezgoda & D. Dimiduk OSU
11:30	QRM 18 Cellular Materials via a Multiscale Quantitative Representation	Y. Zhu & L. Li VIRGINIA TECH
12:00	<b>BREAK</b>	
12:30	QRM 18 Microstructure Manifold Analysis Using Hierarchical Set of Morphological, Topological, and Process Descriptors	O. Wodo & B. Ganapathysubramanian SUNY BUFFALO/ ISU
13:00	YIP A Machine Learning for Structure-Property Relationship	S. Patala NCSU
13:30	Locally Extracted Globally Organized Microstructure Models	V. Sundararaghavan U. MICHIGAN
14:00	<b>BREAK</b>	
14:15	YIP Electronic Structure Basis for Solubility-Phase Stability in Alloys	M. Ghazisaeidi OSU
14:45	EOARD Local Structure and Chemistry in Marginal Glass Forming Alloys	E. Kalay and I. Kalay ODTU
15:15	<b>Q &amp; A Covid Related Challenges</b>	A. Lewis & A. Sayir
17:00	<b>ADJOURN</b>	



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## Wednesday, Agenda Day 2 | October 14, 2020

Time	Topic	Speaker
8:15	ZOOM LOGIN	
<b>PREDICTIVE MATERIAL SCIENCE PART II - MICROSTRUCTURE PROPERTY RELATIONSHIP - PROCESSING SCIENCE</b>		
8:30	High Temperature and Pressure Multicomponent Alloy Design	S. Yang SU A&M
9:00	The Nature of Quasi-periodic Avalanche Bursts Fatigue Cracks	J. El-Awady JHU
9:30	Scientific Understanding of Interfaces	H. Sehitoglu UIUC
10:00	<b>BREAK</b>	
10:30	Quantifying the Defect Character of Grain Boundaries	H. B. Chew UIUC
11:00	Theory and Experimentation of High Temperature Shape Memory Alloys	I. Karaman TEXAS A & M
11:30	Quantification of Atom Probe Tomography Data	W. Windl & E. Marquis U. MICHIGAN / OSU
12:00	<b>BREAK</b>	
12:30	YIP Directionally-Solidified Spiral Eutectics: Chiral Metamaterials	A. Shahani U MICHIGAN
13:00	Short Range Order and Electronic Entropy: from Melts to Solids	A. Allanore MIT
13:30	Carbon Vacancies on Properties of Transition-Metal Carbides	S. Kodambaka UCLA
14:00	Computational-Experimental Reactive Wetting of Hf-Ti-Me Melts	V. Kumar and A. Bronson UTEP
14:30	<b>BREAK</b>	
15:00	High-Temperature Grain Boundaries with Electric Fields	J. Luo UCSD
15:30	Investigation to the Interfacial Understanding of Dissolution	C. Randall PSU
16:00	Advances In Green Processing to form Transparent Ceramics	R. Speyer GIT
16:30	Optical Ceramics Science for High-Power Lasers	R. Gaume UCF
17:00	<b>ADJOURN</b>	





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## Thursday, Agenda Day 3 | October 15, 2020

Time	Topic	Speaker
8:45	<b>ZOOM LOGIN</b>	
<b>EXTREME ENVIRONMENT MATERIALS</b> <b>PART I – FIELD EFFECTS &amp; DIELECTRIC BREAKDOWN OF MATERIALS</b>		
9:00	EOARD 2D Metal Carbides for EM Shielding	G. Buke & C. Cevik TOBB / ANADOLU U.
9:30	Ceramic Nanolaminates for EM Shielding for the RF	J. Kennedy, D. Nepal, R. Pachter, and R. Vaia, FRL
10:00	Mechanisms of Electrical Contact Resistance	M. Baykara & A. Martini UC MERCED
10.30	<b>BREAK</b>	
11.00	Composite Material and Interface Physics of Cathode	W. Tang & T. Back AFRL
11:30	Permittivity, Polarization and Gas Dynamics in Ceramics	B. Tilley WPI
12:00	Millimeter Wave Interactions with High Temperature Materials	B. Hoff AFRL
12.30	<b>BREAK</b>	
13:00	Spin Configuration and Synthesis under EM Field	D. Vashae NCSU
13:30	Nonreciprocal Structures with Phase-Change Components	A. Chabanov & B. Stadler UTSA / U MINNESOTA
14:00	EOARD Surface Roughness Effects in Reflection and Emission of IR	K. Sendur SABANCI
14:30	Field Enhanced Optical Transmission in Metal	M. Berg KANSAS STATE
15:00	Hierarchical Evaporator for Extreme Thermal Management	E. Wang MIT
15:30	<b>ADJOURN</b>	

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Friday, Agenda Day 4   October 16, 2020		
Time	Topic	Speaker
8:45	ZOOM LOGIN	
	<b>EXTREME ENVIRONMENT MATERIALS PART II – DIELECTRIC BREAKDOWN OF MATERIALS</b>	
9:00	EOARD Defects on the Electrocaloric Relaxor Ferroelectrics	E. M. Alkoy & B. Misirlioglu GEBZE / SABANCI U.
9:30	EOARD Controlling Degradation of High-permittivity Dielectrics	A. Klein DARMSTADT
10:00	YIP Multiphysics Modeling of Insulation Materials	M. Ghassemi UVA
10:30	<b>BREAK</b>	
11:00	YIP Nanoscale Pyroelectric Hybrid Materials	J. Shi RPI
11:30	Co-doping Perovskite Dielectrics under Extreme Field	E. Dickey NCSU
12:00	Metal/Dielectric Interface Degradation and Breakdown	D. Irving NCSU
12:30	Nonlinear Optical Imaging of Breakdown in Dielectrics	S. Greenbaum and Y. Ren HUNTER COLLEGE
13:30	<b>JOINT NSF &amp; AFRL OPPORTUNITIES</b>	D. Tilbury, NSF L. Sapochak, NSF P. Balan, NSF R. Vaia, AFRL V. Blackwood, AFOSR J. Maurice, IO - AFOSR
15:00	<b>ADJOURN</b>	

**END OF WEEK 1**



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## Monday, Agenda Day 5 | October 26, 2020

Time	Topic	Speaker
8:30	ZOOM LOGIN	
8:45	WELCOMING REMARKS	
<b>MATERIALS FOR QUANTUM INFORMATION SCIENCE PART I - DESIGN OF DEFECTS</b>		
9:00	Optically active single-defect spin-qubits in ZnSe	E. Waks U. MARYLAND
9:30	NDSEG STUDENT New Materials in Superconducting Qubits	A. Place PRINCETON UNIVERSITY
9:45	Design and synthesis of materials with targeted quantum characteristics	G. Galli & D. Awschalom U. CHICAGO J. Lebeau / MIT Z. Sitar / NCSU
11:45	BREAK	
12:30	YIP Magnetization Dynamics in Magnetic Heterostructure	R. Kukreja UC DAVIS
13:00	NDSEG STUDENT Protection of Spin Coherence in a Tunable Heisenberg Model	B. Periwal STANFORD UNIVERSITY
13:15	PT-Symmetric Programmable Materials	S. K. Ozdemir & M. Demirel PSU
13:45	<b>Materials for QIS Condensed Matter Physics Program Division of Materials</b>	T. Durakiewicz NSF
15:30	ADJOURN	



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## Tuesday, Agenda Day 6 | October 27, 2020

Time	Topic	Speaker
8:45	ZOOM LOGIN	
<b>MATERIALS FOR QUANTUM INFORMATION SCIENCE PART II - FIELD EFFECTS IN ATOMIC SCALE</b>		
9:00	Nonlinear Studies of Electro-Optic and Magneto-Electric Materials	G. Khodaparast, S. Priya, M. B. Raschke, A. Belyanin and C. Stanton VT / COLORADO / FLORIDA
10:15	NDSEG STUDENT: Large Second-order Nonlinearity in Asymmetric Metallic Quantum Wells	S. Bopp UC SAN DIEGO
10:30	Computationally-Guided Discovery of Semiconductors & Conduction Polarity	J. Goldberger & W. Windl OSU
11:15	Nanoscale Probing of Magneto-electric Phases	E. Fohntung & H. Nakotte RPI / NMSU
11:45	BREAK	
12:15	Extreme Nonlinearity in Transition Metal Oxides	A. Demkov and J. Ekerdt UT AUSTIN
13:00	Atomically Thin 2D oxides	A. Sehirlioglu, W. Lambrecht, and X. Gao, M.- H. Berger CWRU / PARISTECH
14:15	Defect Equilibration Studies in Binary Metal-Oxides	S. Ramanathan PURDUE
14:45	PECASE Soft Chemical Approach to the Synthesis of Metastable Matls.	D. Freedman NORTHWESTERN
15:15	<b>Materials Science and Engineering at Oak Ridge National Laboratory</b>	S. Hearne ORNL
16:30	ADJOURN	





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## Wednesday, Agenda Day 7 | October 28, 2020

Time	Topic	Speaker
8:45	ZOOM LOGIN	
	<b>EXTREME ENVIRONMENT ELECTRONICS PART I - <math>\beta</math>-Ga<sub>2</sub>O<sub>3</sub></b>	
9:00	AOARD Growth and study of optical properties of $\beta$ -Ga <sub>2</sub> O <sub>3</sub>	D. Nath INDIAN INST. SCIE., INDIA
9:30	Properties of Gallia Micro and Nanostructures	B. Mendez UCM, SPAIN
10:00	BREAK	
10:45	EOARD Growth Mechanism and Defects in $\beta$ -(Al <sub>x</sub> Ga <sub>1-x</sub> ) <sub>2</sub> O <sub>3</sub> /Ga <sub>2</sub> O <sub>3</sub>	A. Popp and G. Wagner IKZ, GERMANY
11:15	COE 18 - OVERVIEW AFRL-Cornell Center for Epitaxial SolutionS (ACCESS)	M. Thompson CORNELL
11:45	BREAK	
12:30	MURI 18 - OVERVIEW Doping and Defects in $\beta$ -Ga <sub>2</sub> O <sub>3</sub> for High Breakdown Field	M. Scarpulla U UTAH
13:30	MURI 18 - OVERVIEW Gallium Oxide Materials Science and Engineering (GAME )	J. Speck UCSB
14:30	<b>Basic Research Office Vision and Programs MURI, DURIP, VBFF, DEPSCoR, NEWTON, LUCI, and more</b>	B. Nair and J.-L. Cambier OUSD (R&E)/RT/RT&L
16:00	ADJOURN	



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## Agenda Day 8 | October 29, 2020

Time	Topic	Speaker
8:45	ZOOM LOGIN	
	<b>EXTREME ENVIRONMENT ELECTRONICS PART II - <math>\beta</math>-Ga<sub>2</sub>O<sub>3</sub></b>	
9:00	Material Properties of $\beta$ -Ga <sub>2</sub> O <sub>3</sub> for Electronic Applications	S. Badescu, D. Thomson, and S. Ganguli, AFRL
9:30	YIP Investigation of Electron Transport in $\beta$ -(Al,Ga) <sub>2</sub> O <sub>3</sub> Thin Films	E. Ahmadi U MICHIGAN
10:00	Extreme Environment Stability of Wide Band Gap $\beta$ -Ga <sub>2</sub> O <sub>3</sub>	N. Alem PSU
10:30	Fundamental Study of p-Type Doping in MOCVD-Grown Ga <sub>2</sub> O <sub>3</sub>	M. Razeghi NORTHWESTERN
11:00	<b>BREAK</b>	
11:30	Processing and Characterization of Contacts to $\beta$ -Ga <sub>2</sub> O <sub>3</sub>	R. V. Chintalapalle & L. Porter UTEP / CMU
12:00	Strain-stress Relations for Bandgap, Phonon and Plasmon Energy's	M. Schubert U. NEBRASKA LINCOLN
12:30	<b>BREAK</b>	
13:00	SBIR II Development of $\beta$ -Ga <sub>2</sub> O <sub>3</sub> Epitaxial Layers and Heterostructures	A. Osinsky AGNITRON TECHN.
13:30	Mechanisms and Control of Dielectric Breakdown in Electronic Materials	L. Brillson OSU
14:00	<b>ARMY RESEARCH OFFICE OPPORTUNITIES</b>	E. Runnerstrom, D. P. Cole, M. P. Bakas, ARO
15:30	<b>Q &amp; A</b>	
17:00	<b>ADJOURN</b>	