

Aerospace Materials for Extreme Environments Program Review 2014

Dr. Ali Sayir | May 12-16, 2014 | Arlington, VA

Monday, May 12, 2014

Time	Topic	Speaker
7:15-8:00	Registration	
8:00-8:10	Welcome	A. Sayir /AFOSR
8:10-8:30	HISTORY OF AFOSR	R. White / AFOSR
2012 BRI: LAYERED 2D-MATERIALS		
8:30-9:10	Thermodynamic Stability of the Q-2 DEG at the Oxide/Oxide Interface under Extreme Thermomechanical Conditions	A. Demkov, J. Ekerdt, UT AUSTIN & D. Smith /ASU
9:10-9:50	Density Functional Theory Study of Oxide Surfaces and Interfaces / Scanning Tunneling Microscopy Investigation of	M. Skowronski, D. Xi and R. M. Feenstra / CMU
9:50-10:00	COFFEE BREAK	
10:00-10:20	Quantitative Identification of Electro-Physical Properties of Oxide Based Hetero-Interfaces at Extreme Environments	A. Sehirlioglu CWRU
10:20-10:40	Electronic Structure and Point Defects in Oxides: Computational Challenges	W. Lambrecht CWRU
10:40-11:00	Nanostructural Investigation of LaAlO ₃ /SrTiO ₃ Hetero-Interfaces	M. H. Berger ECOLE DES MINES –PARIS
11:00-11:20	LaAlO ₃ /SrTiO ₃ Hetero-interfaces: Electron Transport Effects Vacancy mediated multifunctional oxide devices	X. Gao CWRU
11:20-11:40	Vacancy Mediated Multifunctional Oxide Devices	W. Lu / U. MICHIGAN
11:40-12:10	Atomic Scale Tuning of Layered Binary Oxides	Ashlie Martini / UC MERCED Samir Aouadi /U. N. TEXAS
12:10-13:30	LUNCH	
2013 BRI: METAL-DIELECTRIC INTERFACE – Kick Off		
13:30-14:00	The Role of Interfaces in Performance, Degradation, and Breakdown of Non-Linear Dielectrics	C. Randall, P. Hopkins, and B. Dickey PSU / UVA / NCSU
14:00-14:30	Fundamental Insight of Non-Linear Dielectric Degradation and Breakdown under Extreme Conditions	D. Irwing and L.-Q.- Chen NCSU / PSU
14:30-14:50	Development of Various Perovskite Single Crystals Using Solid-State Single Crystal Growth (SSCG) Technique	H.-Y. Lee S. KOREA
14:50-15:10	Chemical and Electronic Modification of Electrode Interfaces of Non-Linear Dielectrics Under Voltage and Temperature Stress	A. Klein U. DARMSTADT / GERMANY
15:10-15:30	Oxide Dielectric Breakdown	C. Hin / VIRGINIA TECH
15:30-16:00	COFFEE BREAK	
16:00-16:30	Charge Transfer at Metal Dielectric Interfaces Under Extreme Environments	J. Ekerdt and A. Demkov, M.McCartney, C. Young and D. Smith/ UT AUSTIN/ ASU /UT DALLAS / UTD
16:30-17:00	Linear and Nonlinear Spectroscopic Studies of Linear and Nonlinear Dielectrics and Interfaces	S. Greenbaum and Y. Ren HUNTER COLLEGE NY
17:00-17:20	Atomic-Scale Modeling of Equilibrium and Transport Properties at Metal-Dielectric Interfaces	W. Windl OHIO STATE U.
17:20-17:40	High-Temperature Interfacial Thermodynamics and Control of HT Ceramic GB with Electric Field	J. Luo UC SAN DIEGO
	MEETING ADJOURNED FOR THE DAY	

Tuesday, May 13, 2014		
7:15-7:55	Registration	
2012 MURI: MOSAIC OF MICROSTRUCTURE		
8:00-8:20	Shape Descriptors for the Quantification of Microstructure Forward Modeling	M. DeGraef CMU
8:20-8:40	Markov Random Fields: A Pervasive Method for Generating 3D Microstructures from 2D Image Data	V. Sundararaghavan U. MICHIGAN
8:40-9:00	Integrated Sensing for Materials Quantification and Discovery	C. Bouman / PURDUE
9:00-9:20	Data Science Protocols for Microstructure Engineering	S. Kalidindi / GIT
9:20-9:40	Rare Event Simulation for Modeling of Low-Probability Events in Materials Systems	M. Comer PURDUE
9:40-10:00	From Atom Probe Tomography Imaging to Microstructural Quantification: An Iterative Optimization Approach	E. Marquis, W. Windl, Greg Thompson U. MICHIGAN / OSU / U. ALABAMA
10:00-10:30	COFFEE BREAK	
10:30-11:00	1) (12RX01COR) Quantitative, 3D Microstructure Characterization of Fatigue Specimens for Modeling 2) (14RX02COR) (EC) Initiation, and Validation of Crystal Plasticity Finite Element Simulations	A. Pilchak and M. Groeber AFRL / RX
11:00-11:20	Intermetallics	L. Cornish SOUTH AFRICA
11:20-11:40	(YIP) A Transformational Approach to Quantify Chemistry at the Atomic Scale	J. LeBeau NCSU
11:40-12:00	(YIP) Elucidating Wavelength Dependence of Phonon Scattering	R. Wang ARIZONA STATE U.
12:00-12:20	Thermoelectric Nanocomposite Materials for Medium to High Temperature Range	D. Vashaee OKLOHOMA STATE
12:20-13:00	LUNCH	
MATERIALS FOR SPACE PROPULSION		
13:00-13:20	(LRIR) Extreme Environments - Space and Reentry	R. Bemish AFRL / RV
13:20-13:40	Cathode and Anode Materials - Performance and Characterization for Extreme Environment Applications	S. Fairchild AFRL / RX
13:40-14:10	Plasma/Electrode Interactions in Plasma Propulsion and High Current Density Environments	E. Choueiri and J. Polk PRINCETON U. / JPL
14:10-14:30	In Situ Precision Diagnostic Facility for Studies of Materials and Processes far from Equilibrium	R. Wirz UCLA
14:30-15:00	Plasticity in Tantalum and Monazite	J. Kysar / COLUMBIA U.
15:00-15:30	Nano-Precipitation Hardened High Temperature Shape Memory Alloys with Dimensional and Thermal Stability	I. Karaman / TEXAS A&M
15:30-16:00	COFFEE BREAK	
15:30-18:30	Impromptu One-to-One Meetings	
18:30	NO HOST DINNER –YIP & PECASE	

Wednesday, May 14, 2014		
7:15-7:55	Registration	
2012 MURI: TEMPLATE-DIRECTED EUTECTIC METAMATERIALS		
8:00-8:20	Template-Directed Directionally Solidified Eutectic Metamaterials	P. Braun / UIUC
8:20-8:40	Micro/nanofluidic Patterning Techniques	J. Rogers / UIUC
8:40-9:00	Metal Eutectic Solidification	E. P. George / U. TENNESSEE
9:00-9:20	Modeling Eutectic Solidification in Confined Geometries	K. Thornton / U. MICHIGAN
9:20-9:50	Metamaterials and Plasmonic Materials Properties enabled by Directional Solidification	D. Pawlak ITME - POLAND
9:50-10:10	DNA-Templated Fabrication of Arbitrary-Structured Porous Carbon Materials	H. Liu U. PITTSBURGH
10:10-10:30	COFFEE BREAK	
10:30-10:50	Material Properties of Beta-Gallium Oxide	J. Speck and S. Ringel UCSB / OHIO STATE U.
10:50-11:10	Evaluation of Zinc Oxide Nano-Structures from Non-Equilibrium Deposition Condition	X. Wang U. WISCONSIN
11:10-11:40	High Temperature Phase Transformations in Oxide Ceramics	T. Kriven / UIUC
11:40-13:30	LUNCH	
COMBINED EXTERNAL FIELDS		
13:30-13:50	Quantum-Engineered Semiconductor Metamaterials for Giant Non-Reciprocity without Magnetic Effects	A. Alu UT AUSTIN
13:50-14:10	Magneto-electric Energy Conversion of Optical Energy	S. Rand / U. MICHIGAN
14:10-14:40	Nonlinear Terahertz Studies of Electro-Optic and Magneto-Electric Materials	G. Khodaparast, S. Priya, M. B. Raschke, A. Belyanin and C. Stanton VIRGINIA TECH / U. COLORADO / FLORIDA
14:40-15:00	(LRIR) Localized Electron Trap Modification as a Result of Space Weather Exposure in Highly Disordered Materials	R. Hoffmann AFRL / RV
15:00-15:20	(LRIR) The Role of Material Defects in Growth and Disruption of Conductive Filaments in Metal-Oxide Dielectric Layers	A. Voevodin and P.Shamberger / AFRL / RX
15:20-15:40	COFFEE BREAK	
LASER MATERIALS		
15:40-16:10	Transition Metal and Rare Earth doped II-VI Chalcogenides for Optically and Electrically Pumped Broadly Tunable Mid-IR Lasers	S. Mirov, R. Camata, R. Kawai and V. Fedorov U. ALABAMA
16:10-16:30	Science-Based Understanding of Polishing of Polycrystalline Laser Ceramics	H. Greenslet U. FLORIDA
16:30-16:50	Processing Developments for Sintering Yb ³⁺ :Lu ₂ O ₃ Laser Hosts to Transparency	R. Speyer GIT
16:50-17:00	PM's Remarks on the Technical Direction	A. Sayir / AFOSR
17:00	MEETING ADJOURNED FOR THE DAY	

Thursday, May 15, 2014		
7:15-7:55	Registration	
SUSTAINABLE MATERIALS		
8:00-8:20	Searching for Rare Earth Element Alternatives through “Crystal Engineering”	K. Rajan / IOWA STATE U.
8:20-8:40	Site Preference of Alloying Elements using Density Functional Theory	S. Sinnott / FLORIDA
8:40-9:00	Quantitative Aberration Corrected Electron Tomography	J. LeBeau / NCSU
9:00-9:20	Quasi Static and Dynamic Behavior of Materials	S. Saxena / FIU
9:20-9:40	(2014 YIP) Molecular Models to Investigate Diamagnetic Anisotropy: Directed Synthesis of Rare-Earth Free Magnets	D. Freedman NORTHWESTERN
9:40-10:00	COFFEE BREAK	
10:00-10:40	Direct and Inverse Design Optimization of Magnetic Alloys	G. Dulikravich, C. Koch and J. Schwartz FIU / NCSU
10:40-11:00	(LRIR) High Pressure Nanocrystallization of Rare Earth Element Based Permanent Magnets	J. Horwath, L. Semiatin, Z. Turgut / AFRL/RXQQM
11:00-11:20	(STTR I) First-Principles for Discovery Non-Rare-Earth Alloy	R. Sabirianov, N. Al-Aqtash, T. Rana, D. Sengupta and H. Zeng / CFD CORP.
11:20-11:40	(STTR I) Rare Earth Free High Performance Magnets	J. Liu ELECTRON ENERGY CORP.
11:40-12:00	(STTR I) Sustainable Alloy Design Rare Earth Materials	J. Chen AEGIS TECHNOLOGY
12:00-13:30	LUNCH	
BULK METALLIC GLASSES		
13:30-13:50	Molecular Dynamics Study of Metal-Metallic Glass Composites	W. Windl / OHIO STATE U.
13:50-14:10	Metallic Glass Composites	K. Flores / WASHINGTON U.
14:10-14:30	Atom Probe Tomography for Bulk Metallic Glasses	E. Marques/ U. MICHIGAN
14:30-14:50	Processing Science of Bulk Metallic Glasses	D. Hoffmann / CALTECH
14:50-15:10	Bulk Metallic Glass Nanowire	A. Taylor / YALE
15:10-15:30	COFFEE BREAK	
15:30-16:00	Nano-Precipitation Hardened High Temperature Shape Memory Alloys with Dimensional and Thermal Stability	I. Karaman / TEXAS A&M
16:00-16:40	1) Electroplating Rhenium and Its Alloys 2) DURIP	R. Taylor and N. Eliaz TEXAS A&M / TEL AVIV U.
16:40-17:10	Micro-Engineered Material Surfaces for Electric Propulsion and Pulsed Power	N. Ghoniem, I. Kaganovich, and Y. Raitses UCLA / PRINCETON U.
	MEETING ADJOURNED FOR THE DAY	

Friday, May 16, 2014		
7:15-7:55	Registration	
BORIDES		
8:00-8:20	Mo-Si-B Alloys and Diboride Systems for High Enthalpy Environments	D. Fletcher U. VERMONT
8:20-8:40	Development of Novel, Resilient Multi-Phase UHTCs with Tailored Structures	M. Akinc and M. Kramer IOWA STATE U.
8:40-9:00	Oxidation, Environmental Coatings and Phase Stability in Mo-Si-B Alloys and Diborides	J. Prepezko U. WISCONSIN MADISON
9:00-9:20	Optical Diagnostics and Modeling of UHTC Volatilization in High-Enthalpy Test Environment	J. Marshall SRI INTERNATIONAL
9:20-9:40	Computational -Experimental Processing of Boride/Carbide Composites by Reactive Infusion of Hf Alloy Melts into B ₄ C	A. Bronson and V. Kumar UT EL PASO
9:40-10:00	Fundamental Thermal and Mechanical Properties of Borides	G. Hilmas and B. Fahrenholtz MS & T
10:00-10:20	(STTR PHASE II) Reactive Fusion Welding for Ultra-High Temperature Ceramic	C.-W. Kim and G. Hilmas MO-SCI CORP.
10:20-10:40	COFFEE BREAK	
10:40-11:10	UHTC-Based Hot Structures for Space Re-entry – Lesson Learned and Future Perspectives at Centro Italiano Ricerche Aerospaziali (CIRA)	S. Cantoni and L. Vecchione CIRA - ITALY
11:10-11:30	High Resolution TEM Investigation of Ultra High Temperature Materials	D. Sciti and Laura Silvestroni ISTEC - ITALY
11:30-11:50	TBA	
11:50-14:00	LUNCH	
CARBIDES		
14:00-14:20	Atomistic Exploration of Impurity Effects on the Intrinsic Brittleness of Silicon Carbide	D. Warner CORNELL
14:20-14:40	Influence of Group IV& V Alloying Elements on the Microstructure Engineering and Deformation in TaC	G. Thompson U. ALABAMA
14:40-15:00	In Situ Studies of Thermal, Chemical and Mechanical Stabilities of Refractory Materials	Suneel Kodambaka UCLA
15:00-15:20	Fabrication and Characterization of Novel Refractory Coatings using Combinatorial Nanocalorimetry	J. Vlassak HARVARD U.
15:20-15:40	1) Graphene Nano-platelet Reinforced TaC 2) (DURIP)Advanced Nanocomposites Reinforced with Boron Nitride Nano Tubes	A. Agarwal FIU
15:40-16:00	COFFEE BREAK	
16:00-16:20	Near-Net-Shaping of Multi-scale Porosity UHTC Materials	C. Tallon Galdeano U.MELBOURNE /AUSTRALIA
16:20-17:10	1) High Emissivity Rare-Earth Oxides for Hypersonic 2) Ab-initio Characterization of High-Emissivity Oxide Coatings	1) R. Trice and 2) A. Strachan PURDUE
17:10-17:40	1) Magnetic-Field-Assisted Ceramic Nanocomposites 2) (DURIP) Microwave Assisted Geopolymer Synthesis	K. Kornev CLEMSON U.
	MEETING ADJOURNED	