

Panel on Review of In-house Laboratory Independent Research in Materials Science at the Army's Research, Development, and Engineering Centers

Committee

Michael I. Baskes

Chair

EDWIN L. THOMAS (NAE) is the E.D. Butcher chair of Engineering and Professor of Materials Science and NanoEngineering in the George R. Brown School of Engineering at Rice University. Dr. Thomas carries out research on photonics, phononics, interference lithography and mechanical behavior of microtrusses, polymer physics and engineering of the mechanical and optical properties of block copolymers, liquid crystalline polymers, and hybrid organic-inorganic nanocomposites. One area of special interest is photonics and the fabrication of polymeric photonic crystals using self-assembly, especially with block copolymers, and holographic interference lithography. For these studies, a large emphasis is placed on the understanding of complex relations between the lattice symmetry and optical properties of periodic structures. Another area of particular focus is phononics. He is exploring the way light and sound propagate in quasicrystalline photonic and phononic structures. Other major topics in Dr. Thomas' research are structured polymers. His structured materials research concentrates on enhancing the ability to fabricate complex structures with characteristic length in submicron and nanometer range in order to create materials with superior properties that can be tailored to a particular application. Understanding the influence of composition and processing conditions on the resultant microstructure of polymers and how this determines the properties is the central part of his polymer morphology research. Dr. Thomas was elected a fellow of the American Physical Society, a fellow of the American Association for the Advancement of Science, and an inaugural fellow of the Materials Society. In 2009 he was elected to the American Academy of Arts and Sciences. He coauthored the undergraduate textbook *The Structure of Materials* and a research monograph, *Periodic Materials: Photonics, Phononics and Mechanics*, and he has published over 450 papers and holds 20 patents. Dr. Thomas received a Ph.D. in materials science from Cornell University, and a B.S. in mechanical engineering and engineering science from the University of Massachusetts.

Kevin R. Anderson

Member

KEVIN ANDERSON, NAE is a Brunswick Senior Fellow at the Mercury Marine Division of the Brunswick Corporation. He was formerly the leader of aircraft materials and physical metallurgy at Reynolds Aluminum Research. Dr. Anderson is an inventor of high damage tolerant diecasting alloys that are made from 100% recycled aluminum, and are registered with the Aluminum Association. In addition to receiving several important industrial awards for his work, Dr. Anderson holds over 30 United States patents with the vast majority successfully in production. He has taught aluminum metallurgy on an international level since 1999, is presently the chairman of the Advanced Casting Research Consortium at Worcester Polytechnic Institute, chairman of the Materials Innovation Committee of TMS, and a member of the Grainger Institute for Engineering Advisory Board at the University of Wisconsin. Dr. Anderson was honored to serve as a TMS ambassador for the Materials Genome Initiative of the National Science and Technology Council and the White House Office of Science and Technology policy. Dr. Anderson has been honored to contribute and provide guidance to both the U.S. Department of Energy on recycling and sustainability, and the U.S. Department of Defense on materials issues. Dr. Anderson is a fellow of the American Society for Materials. He earned a B.S., M.S., and Ph.D. in metallurgical engineering from the University of Illinois at Urbana-Champaign.

Deborah D. Chung

Member

DEBORAH D.L. CHUNG is a professor at the University at Buffalo, The State University of New York. She is an international leader in the field of multifunctional structural materials. Dr. Chung is best known for her invention of smart concrete. Smart concrete is concrete that is itself a sensor of strain and damage. In addition, she is the inventor of: exfoliated graphite fibers, carbon fiber reinforced superconductors, and carbon fiber composites with improved fatigue resistance, all of which were selected by the National Institute of Standards and Technology for funding through the Energy-Related Inventions Program of the Department of Energy. Dr. Chung is a fellow of American Society for Metals (ASM) International and American Carbon Society. The honors she was received include: the Pettinos Award from the American Carbon Society; the Top Reviewer Award from the Carbon Journal; the Niagara Mohawk Power Corporation Endowed chair professorship; the Chancellor's Award for Excellence in Scholarship from the State University of New York; the Honorary Doctorate degree from University of Alicante, Spain; and the Hardy Gold Medal from the American Institute of Mining, Metallurgical, and Petroleum Engineers. She has authored or co-authored 560 archival international journal papers, in addition to eight books, which include Carbon Composites (Elsevier, 2016). Her Google Scholar h-index is 87, with 28,020 citations. Dr. Chung earned her Ph.D. degree in materials science from Massachusetts Institute of Technology.

Mark Eberhart

Member

MARK EBERHART is a professor in the Department of Chemistry and Geochemistry at the Colorado School of Mines, where he directs the Molecular Theory Group (MTG). At the MTG, knowledge of bonding is obtained through detailed topological analyses of the spatial distribution of electrons in molecules and solids. Many subtle aspects of the distribution become obvious when viewed from a topological perspective. The accompanying topological formalism gives well-defined, unambiguous, meaningful, and consistent definitions to previously indeterminate quantities such as atomic bonds and basins. His work is based primarily on first principles computations, which provide the electron charge densities, and topological analysis software developed at the MTG. He is also exploring the topological and geometric origins responsible for the stability of amorphous metallic alloys. In addition to his work on condensed phase systems, his group has active research programs exploring the relationships between charge density and the chemical properties of molecular systems, both organic and inorganic. Dr. Eberhart holds a B.S. degree in chemistry and applied mathematics from the University of Colorado, an M.S. degree in physical biochemistry from the University of Colorado, and a Ph.D. in materials science and engineering from the Massachusetts Institute of Technology.

Olivia A. Graeve

Member

OLIVIA GRAEVE is a professor in the Department of Mechanical and Aerospace Engineering, director of the CaliBaja Center for Resilient Materials and Systems, and faculty director of the IDEA Student Center at the University of California, San Diego. Her area of research focuses on fundamental studies of the synthesis and processing of nanostructured materials, including ceramic and metallic nanomaterials and amorphous/nanocrystalline composites for both structural and functional applications—with a special emphasis on electromagnetic multifunctional materials for sensors and energy applications. Her publications include have appeared in Chemistry of Materials; the Journal of the American Ceramic Society; Langmuir; American Chemical Society (ACS) Applied Materials and Interfaces; Biomaterials; the Journal of Physical Chemistry; the Journal of Materials Research; Scientific Reports; Nanotechnology; the Journal of Applied Physics, and Optical Materials, among others, and have been presented in over 200 invited, contributed, and poster presentations at local, national, and international meetings. She has served on numerous committees of her primary societies (American Ceramic Society, Materials Research Society, Society of Hispanic Professional Engineers, and Sociedad Mexicana de Materials) in many different capacities and actively participates in organizing national and international conferences, as well as serving on various review boards and advisory panels. More recently, she has been named into the Tijuana Walk of Fame (2014) and to the Mexican Academy of Engineering (2016). Dr. Graeve holds a Ph.D. in materials science and engineering from the University of California, Davis, and a B.S. in structural engineering from the University of California, San Diego.

Joanna R. Groza

Member

JOANNA R. GROZA is Emeritis Professor of Materials Science and Engineering at the University of California, Davis. Her research interests are in electrical field/current activated sintering – to understand the effects of electrical field application in powder sintering; control of field activated sintering technique process to achieve optimum final properties; sintering of nanocrystalline materials with emphasis on biomaterials; processing microstructure property relationships to improve the basic knowledge of materials behavior in high-temperature and fatigue conditions (e. g., in nanocomposites); and abnormal grain growth in polymorphic materials. Dr. Groza received an M.S. in metallurgy engineering and a Ph.D. in physical metallurgy from the University Politehnica of Bucharest.

Max Shtein

Member

MAX SHTEIN is a professor in the Department of Materials Science and Engineering in the College of Engineering at the University of Michigan. His group focuses on the science, processing, and application of functional organic and hybrid materials for electronics and optoelectronics, including lighting, displays, photovoltaic and thermal energy conversion devices. He is using modeling and experimental advances in optics and electronics to develop novel multi-scale, fiber-based devices, as well as origami- and kirigami-inspired functional structures. Similarly, he uses his expertise in molecular organic materials processing to enhance the performance and manufacturability of pharmaceuticals. His work combines rigorous computer modeling validated by experiments, spanning fundamental and applied research topics. Dr. Shtein earned a B.S in chemical engineering from the University of California at Berkeley and a Ph.D. in chemical engineering from Princeton University. He holds numerous, licensed US and international patents, co-founded two technology startups, served as faculty co-director for the undergraduate program in Entrepreneurship in the College of Engineering, and co-authored a book Scalable Innovation: A guide for Inventors, Entrepreneurs, and IP Professionals (Taylor & Francis, 2013; ISBN-10: 1466590971).

Francis W. Zok

Member

FRANK ZOK is distinguished professor of materials at University of California, Santa Barbara (UCSB). He also serves as director of the Pratt and Whitney Center of Excellence in Composites at UCSB. He was formerly associate chair of the Materials Department. His research over the past 25 years has addressed issues in mechanical properties of multiphase materials and structures. His current activities focus on hierarchical lightweight cellular materials and high-temperature ceramic composites. He has contributed to five book chapters and about 190 scientific publications. His professional service to the community includes: membership on a National Academies study on Application of Lightweighting Technology to Military Vehicles, Vessels, and Aircraft (2011-12); associate Editor of the Journal of the American Ceramic Society (since 1993); the editorial a board for Current Opinion in Solid State and Materials Science (1998-2008); the Scientific Advisory Board for the Air Force Research Laboratory (AFRL) Materials and Manufacturing Directorate (2005); the National Academies Technical Assessment Board for the Army Research Laboratory Panels on Air and Ground Vehicle Technology (2000-04) and on Armor and Armaments (2005-08); the National Science Foundation Panel on Nanomechanics (2006); the Expert Review Committee on Materials Science, Canada Foundation for Innovation (2008); and Chair of the Scientific Advisory Board for the Canadian Magnesium Network (2009-14). He is a fellow of the American Ceramic Society. He earned a Ph.D. in materials from McMaster University.