

Army Research Laboratory Technical Assessment Board: 2024 Panel on Assessment of Sciences of Extreme Materials

Committee

John Klier

Chair

John Klier (NAE) is the dean of the Gallogly College of Engineering and professor in the School of Chemical, Biological and Materials Engineering at the University of Oklahoma. His research examines novel materials for high performance coatings and adhesives, structured polymer colloids and emulsion polymers, and new approaches to polymer crosslinking. Dr. Klier served as a professor and department head of chemical engineering at the University of Massachusetts, Amherst, following a 26-year career at The Dow Chemical Company, where he worked in numerous areas of polymer, surfactant, and colloid science. His responsibilities included leading the materials-related organizations in Core R&D, leading Dow Coating Materials research and development organization, and most recently leading the Performance Materials and Chemicals divisional research, development and technical service organizations. In 2014, he was named Distinguished Fellow, the highest technical position at Dow. Dr. Klier is a member of the National Academy of Engineering, the National Academy of Inventors, and several professional organizations. He has been awarded with The AIChE Industrial Research and Development Award in 2015, and the Purdue Outstanding Chemical Engineering Award. He earned his B.S. from MIT, and his M.S. and Ph.D. from Purdue University, all in chemical engineering.

Amy Clarke

Member

Amy J. Clarke is a Distinguished Scientist in the Sigma Manufacturing Sciences Division at Los Alamos National Laboratory (LANL) and holds a faculty joint appointment with the Department of Metallurgical and Materials Engineering (MME) at the Colorado School of Mines (Mines). Previously, she was the John Henry Moore Distinguished Professor of Metallurgical and Materials Engineering in MME at Mines. She serves as Director of a five-year, multi-university National Nuclear Security Agency (NNSA) Stewardship Science Academic Alliances Center of Excellence on Advanced Characterization of Metals under Extreme Environments at Mines and as Co-Director of an NNSA Predictive Science Academic Alliance Program III, Multidisciplinary Simulation Center led by the University of Colorado Boulder. She has served as Co-Director of the Center for Advanced Non-Ferrous Structural Alloys, a National Science Foundation Industry/University Cooperative Research Center at Mines and Iowa State University and collaborates with the Advanced Steel Processing and Products Research Center at Mines. Her research focuses on physical metallurgy; making, measuring, and modeling metallic alloys during processing to realize advanced manufacturing; and processing-structure-properties-performance relationships in advanced materials. Amy serves on The Minerals, Metals & Materials Society (TMS) Foundation Board of Trustees, is an Editor for Metallurgical and Materials Transactions A, and has served on the TMS and Association for Iron & Steel Technology Boards of Directors. She received a Presidential Early Career Award for Scientists and Engineers (nominated by the U.S. Department of Energy (DOE) and NNSA Defense Programs), an Office of Naval Research Young Investigator Program, a U.S. DOE Office of Science Early Career Research Program award, and the 2022-2023 Mines Excellence in Research Award (Senior). She is an alumni of the National Academies of Sciences' 2014 U.S. Frontiers Kavli Frontiers of Science symposium, a TMS Brimacombe Medalist, and Fellow of ASM International. Amy received her MS and PhD degrees from Mines and her BS degree at Michigan Technological University in Metallurgical and Materials Engineering.

Kathryn Dannemann

Member

Kathryn Dannemann serves the Rensselaer Polytechnic Institute School of Engineering as the Director of the O.T. Swanson Multidisciplinary Design Laboratory. In this role, she is responsible for setting the vision for the Design Laboratory and the senior capstone design experience, obtaining industry sponsorships for senior design projects, planning and teaching courses and furthering pedagogical innovations. She has over 30 years of industrial and research experience. Dr. Dannemann has directed applied research and development programs bridging her extensive knowledge of materials response to solve design challenges for engineering applications ranging from aircraft fuel lines, military and commercial vehicles, naval vessels to the space shuttle, gas turbines, and biomedical systems. Her materials expertise covers a broad range of materials: metals, ceramics, glasses, composites, porous metals and geologic materials. Dr. Dannemann is most recognized for her work on the interactive effects of microstructure and processing on materials performance in extreme environments. Prior to returning to Rensselaer in January 2017, Dr. Dannemann was a Principal Engineer in the Engineering Dynamics Department at Southwest Research Institute in San Antonio, TX for 20 years. Other industry experiences include: Staff Metallurgist at the General Electric Company R&D center, Lead Engineer at GE Power Systems and Research Engineer at Bethlehem Steel Homer Research Laboratories. She is the author of over 150 government/industrial reports, presentations and publications. Dr. Dannemann served as President of the Society for Experimental Mechanics in 2017-18. She is a Fellow of ASM International, and also served on the Board of Trustees for ASM International from 2014-17. Dr. Dannemann has taught graduate and undergraduate courses, served as a counselor for the Society of Women Engineers student chapter at Trinity University for 10 years, and helped to initiate the ASM Teachers Materials Camp in San Antonio in conjunction with the Alamo Chapter of ASM International, the ASM Foundation, the US Air Force, and St. Mary's University. Dr. Danneman earned B.S. and M.S. degrees from Rensselaer Polytechnic Institute and a Ph.D. Materials Engineering from Massachusetts Institute of Technology.

Javier Garay

Member

Javier E. Garay is associate dean for Research at the Jacobs School, a professor of mechanical and aerospace engineering at the University of California - San Diego, and the principal investigator of a vibrant experimental laboratory called the Advanced Material Processing and Synthesis (AMPS) Lab. Research in the AMPS Lab focuses on advanced material processing and synthesis with particular emphasis on designing the micro/nanostructure of bulk materials for property optimization. On the fundamental side, current research emphasizes the understanding of the role of the length scale of nano-/ micro-structural features on light, heat, and magnetism. On the applied side, he develops materials for next generation optical devices, magnetic devices, and energy storage. Dr. Garay previously was a professor at UC Riverside, where he also served as chair of the Materials Science and Engineering Program. He received the Faculty Early Career Development (CAREER) award from the National Science Foundation in 2010. He received his B.S. in mechanical engineering, M.S., and Ph.D. in materials Science and engineering, all from the University of California, Davis.

Hatsuo Ishida

Member

Hatsuo Ishida is professor of Organic Chemistry, Distinguished Research Professor, and Professor of Macromolecular Science and Engineering at Case Western University. His research interests include: The development of advanced benzoxazine resins and thermosetting resins based on natural renewable materials for electronic and coating applications, the development, design and synthesis of new materials using benzoxazine chemistry, including materials for extreme performance polymers, such as extremely high thermal stability polymers, polymers that protects astronauts from ultra-high energy galactic cosmic rays, polymers for next generation rocket nozzles, ultra-high strength polymer concrete; polybenzoxazine aerogels that adsorb metallic ions for water clean-up, effective collection of rare metals and greenhouse gas, CO₂; benzoxazine composites and nanocomposites for thermal management, ballistic applications, aerospace, electronic and automotive industries; benzoxazines derived from natural renewable resources, such as cashew nuts oil, cellulose, lignin, chitosan and vanillin. Other areas of activities include design and molecular characterization of reinforcement and composite interfaces, thermal and rheological characterization of matrices for composites. He also develops and characterizes green flame retarding systems using ultra-thin nanocomposite coatings. He has a Ph.D. in macromolecular science from Case Western Reserve University.

Michele V. Manuel

Member

Michele V. Manuel is the Rolf E. Hummel Professor of Electronic Materials and chair of the Department of Materials Science and Engineering at the University of Florida. Manuel's research lies in the basic understanding of the relationship between processing, structure, properties, and performance. Manuel uses a systems-based materials design approach that couples experimental research with theory and mechanistic modeling for the accelerated development of materials. Manuel's current research is focused on using systems-level design methods to advance the development of new materials through microstructure optimization. Specific interests include lightweight and functional materials, advanced manufacturing, and materials and systems under extreme environments - specifically at high magnetic fields or under irradiation. Manuel is the recipient of Presidential Early Career Award for Scientists and Engineers, a National Science Foundation CAREER Award, a NASA Early Career Faculty Award, an ASM Bradley Stoughton Award for Young Teachers, an American Vacuum Society Recognition for Excellence in Leadership, an Early Career Faculty Fellow Award from The Minerals, Metals and Materials Society (TMS), a TMS Brimacombe Medalist, a TMS/Japan Institute of Metals International Scholar Awards, and an ASM Fellow. Manuel received a Ph.D. in materials science and engineering at Northwestern University.

Viktor A. Podolskiy

Member

Viktor Podolskiy is a professor and graduate coordinator at the Department of Physics and Applied Physics at the University of Massachusetts. Dr. Podolskiy's research is focused on theory and modeling of optical properties of nano- and micro-structured composites, metamaterials, and plasmonic systems. He has expertise in materials science, light-matter interaction with emphasis on composite materials, computational science, and machine learning. He previously worked at the Physics Department of Oregon State University as Assistant Professor, and later as Associate Professor. He has presented over 80 invited talks, and co-authored over 100 peer-reviewed publications, over 60 conference proceedings, and 3 U.S. patents. Dr. Podolskiy is a Fellow of the Optical Society (OSA) and of American Physical Society (APS). He earned his B.S. degree in applied mathematics and Physics from Moscow Institute for Physics and Technology in 1998, followed by M.S. in computer science and Ph.D. in physics from New Mexico State University in 2001 and 2002 respectively. Upon completion of Ph.D. program, Dr. Podolskiy joined Electrical Engineering Department of Princeton University as Post Doctoral Research Associate.

Rodney Trice

Member

Rodney Trice is a professor of materials science at Purdue University in a civilian faculty position for the U.S. Navy. His research focuses on injection molding of ceramics (zirconium diboride, boron carbide, silicon nitride, alumina); 3D printing of ceramics (DLP, DIW/Extrusion Methods), ceramic matrix composites, and carbon-carbon composites; high emissivity coatings and IR and RF window materials for hypersonic flight; thermal barrier coatings; suspension plasma spray; hot corrosion and biofuel corrosion of gas turbine ceramics; armor materials; and high-temperature heat exchanger fabrication and mechanical testing. Dr. Trice previously held a sabbatical appointment at Sandia National Laboratories and positions at Lockheed Martin Aerospace and Northrop Grumman. He holds a BS and MS from the University of Texas at Arlington and a PhD in materials science and engineering from the University of Michigan.

Aniruddh Vashisth

Member

Aniruddh Vashisth is an assistant professor of mechanical engineering at the University of Washington. His main areas of interest in advanced composite materials are in sustainable toughened composites, self-healing ultra-strong/light carbon-fiber composites, energy efficient manufacturing, and nano-structure-property relationship. His group focuses on understanding the underlying physics of advanced composites using a closely coupled experimental and theoretical approach. His work has applications in mechanical, aerospace, materials, and transportation industries. He plans to further explore fabrication and characterization of lightweight toughened composites, and mechanics of polymer-derived ceramics, rapid manufacturing of composites using Radio Frequency fields, and using atomistic simulations to understand the processing-structure-property relationship for materials. He/she has developed Accelerated ReaxFF (reactive atomistic simulations) that can simulate reactive kinetics for high barrier energy reactions, this method has been incorporated in commercially available software such as SCM-ADF and LAMMPS. He has also published on the ballistic impact response of carbon/epoxy tubes with variable nanosilica content. He currently has two provisional patents on his work on targeted heating for multi-material bonding and continuous processing of carbon fibers using Radio Frequency Fields. He received a BTech in civil engineering from the Indian Institute of Technology and his M.S. and Ph.D. in Engineering Sciences and Mechanics Engineering from Pennsylvania State University.

Olesya Zhupanska

Member

Olesya Zhupanska is a Professor in the Department of Aerospace and Mechanical Engineering at the University of Arizona. She has expertise in solid mechanics, mechanics of composites with a particular emphasis on structural composites in extreme environments (mechanical, thermal, and electromagnetic multi-field effects), and multifunctional composites. Dr. Zhupanska is Fellow of the American Society of Mechanical Engineers (ASME) and Associate Fellow of the American Institute of Aeronautics and Astronautics. She is the recipient of the DARPA Young Faculty Award, Elsevier Young Composites Researcher Award from American Society for Composites (ASC), ASME/Boeing Structures & Materials Award, ASC Best Paper Awards, two National Research Council Senior Research Associateship Awards and multiple Air Force Summer Faculty Fellowships. Dr. Zhupanska is the President of the American Society for Composites. She received her B.S./M.S. in Mechanics and Applied Mathematics from Taras Shevchenko National University of Kyiv, Ukraine, in 1996, and her Ph.D. in Mechanics of Solids and Applied Mathematics from Taras Shevchenko National University of Kyiv in 2000.