SAN DIEGO STATE UNIVERSITY

Mechanical Engineering
Fall Seminar Series

Carbon Nanotube & Graphene Hybrid Materials Systems for Multifunctional Applications

Tuesday, October 16th, 11:00 am-12:00 pm; Room E-203E

Abstract: Due to their exceptional stiffness, strength, thermal and electrical conductivity, carbon nanotubes and graphene have the potential for the development of nano hybrid materials for a wide variety of applications. In order to achieve the full potential of carbon nanotubes and for structural, thermal and electrical applications, carbon nanotubes and grapheme need to be developed into bulk fully integrated hybrid materials. Full integration of nanotubes and graphene requires their development beyond conventional composites so that the level of the non-nanotube material is designed to integrate fully with the nanotubes and graphene. Here the carbon nanotubes are part of the matrix rather than a differing component, as in the case of conventional composites. In order to advance the development of multifunctional materials integrating nanotubes and graphene, this research is focused on the simultaneous control of nanoarchitecture, structural properties, thermal and electrical conductivity of fully integrated hybrid materials. These are hybrid materials systems designed to surpass the limits of rule of mixtures engineering and composite design. The goals are to implement multifunctional designs to fully mimic the properties of carbon nanotubes and grapheme on larger scales for enhanced thermal and electrical management in addition to the control of other properties such as strength, toughness energy and power. These new approaches involve exfoliation, functionalization, dispersion, stabilization, alignment, polymerization, reaction bonding and coating in order to achieve full integration. Typical examples of structural applications of polymeric and ceramic matrices and applications in energy systems such as capacitors and batteries as well as other material systems are presented and discussed.

Dr. Fernand D.S. Marquis

BIO: Dr. Marquis is an Adjunct Professor in the Department of Mechanical Engineering at SDSU, and has also been a Professor at the Wayne E. Meyer Institute of Systems Engineering and the Department of Systems Engineering at the Naval Postgraduate School in Monterey California. He taught extensively at the Department of Mechanical and Astronautical Engineering at the Naval Postgraduate School and at the Department of Materials and Metallurgical Engineering at the South Dakota School of Mines and Technology. His most recent research focuses on Nanotechnology and Nanosystems, Nanostructured Hybrid Material Systems, Alternative and Renewable Energy Systems, Defense Energy Systems and Thermal Management Systems and Nano and Microstructural Design of Multifunctional Materials. He received advanced degrees from the Imperial College of Science, Technology and Medicine (PhD and DIC), and from the University of Lisbon (PhD and Diploma of Engineering). He has been an active Chartered Engineer and a Registered Professional Metallurgical, Chemical and Industrial Engineer. He has several patents and patent applications, eleven disclosed inventions of available technologies for licensing and commercialization, over 100 refereed publications, edited fifteen books, and wrote several book chapters, over 35 special reports and five monographs. He supervised over 35 Master and PhD students, delivered over 40 invited and keynote lectures and gave over 100 contributed presentations. He has received many awards, such as Fellow of the American Society for Materials (FASM), Fellow Royal Microscopical Society, Member Euro Mediterranean Academy of Arts and Science. He is an ABET Program Evaluator for Materials Engineering, Metallurgical Engineering and Polymer Engineering.

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