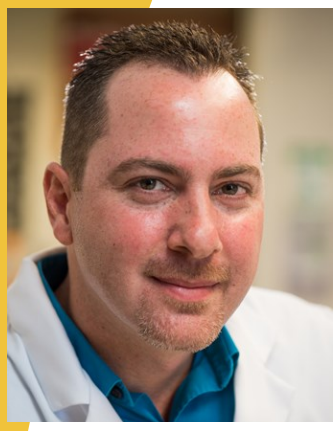
College of Engineering
Department of
Mechanical & Industrial Engineering

The Sidney E. Fuchs Seminar Series



3:00-3:50pm, Friday, September 23rd, 2016
Frank H. Walk Design Presentation Room

Carbon-Based Materials from Nanoscale Building Blocks

by Angel A. Martí*

**Associate Professor, Department of Chemistry,
Rice University**

The manipulation of nanometer-sized objects into ordered arrays is fundamental to the design and synthesis of new materials. These materials generally possess new or amplified properties in comparison with disordered bulk systems. The organization of carbon nanotubes (small tubes made of carbon a 100 million times smaller than a pencil) to form new materials is an intense area of research in nanotechnology and important for the development of technologies based on carbon nanotubes (CNTs). Important applications of such materials involve the fabrication of improved sensors, ultrastrong materials, drug delivery, light activated therapy, gas storage, and artificial photosynthesis, among others. We have shown how carbon nanotubes have been processed into materials when first converted into carbon nanotubides. Carbon nanotubides are negatively charged carbon nanotubes that spontaneously exfoliate in aprotic solvents. Using crown ether we were able to obtain high concentration of carbon nanotubes that can be used to generate macroscopic materials such as fibers. Similarly, graphene can be converted to graphenide (negatively charged graphene) and used for the generation of hybrid carbon nanotube-graphene fibers. We will show how some of the materials can be assembled (including films and fibers) and some of their physical, mechanical and spectroscopic properties.

* Angel A. Martí is currently an Associate Professor of Chemistry, Bioengineering and Material Sciences and Nanoengineering at Rice University in Houston. He obtained his BS degree in Chemistry in 1999 from the University of Puerto Rico in Río Piedras and his PhD in 2004 from the same institution under the supervision of Prof. Jorge Colón. During his Ph.D., Dr. Angel Martí studied the photophysical properties of metal complexes immobilized in layered zirconium phosphate materials. In 2004 he joined Prof. Nicholas Turro's research group at Columbia University as a postdoctoral research scientist, where he worked in the development of fluorescent probes for the detection of trace amounts of DNA and RNA in vivo and in vitro, ortho-para hydrogen conversion, singlet oxygen deactivation and in supramolecular and nanoscale systems. In July 2008, Dr. Angel Martí joined the Department of Chemistry at Rice University in Houston, with secondary appointments in the departments of Bioengineering and Materials Science & Nanoengineering. So far he has published over 60 peer-reviewed publications, some of the most recent on sensing biomolecules in complex environments, supramolecular photochemistry and carbon nanotechnology. He was also conferred the 2013 Inter-American Photochemical Society Young Investigator Award and the 2014 American Society for Photobiology New Investigator Award.