UCF | NanoScience Technology Center

UNIVERSITY OF CENTRAL FLORIDA

GRADUATE RESEARCH SEMINAR SERIES

Friday
December 8, 2017

12:45 PM

Research Pavilion
NSTC
Conference Room 169

Pizza and drinks will be provided

Anisotropic Electrical Conductivity in Polymer Derived Ceramics Induced by Graphene Aerogels

Chen Shen
Dr. Lei Zhai's Group

Polymer derived ceramics (PDCs) is a class of silicon-based ceramics synthesized by thermal pyrolysis of polymeric precursors with various attractive properties such as excellent thermal stability, mechanical strength, and chemical inertness. The preparation of green bodies from liquid polymeric precursors enables the integration of a variety of functional materials as well as the fabrication of composites with complex shapes. Besides, PDCs can be synthesized at the temperature several hundred Celsius degrees lower than that for traditional ceramics synthesis but keeping their superior properties. These advantages make PDCs composites as promising materials for applications in energy storage, electromagnetic energy absorption, and high temperature sensors. To date, efforts to fabricate PDC composites have focused primarily on composites in the forms of fibers and thin films, and have yet to investigate the effect of carbon materials alignment on properties of bulk PDC composites. Reduced graphene oxide aerogels (rGOAs) prepared from directional freeze drying have well-aligned anisotropic structures, and their effect on bulk PDC composites will be discussed in this presentation. The rGOAs function as reinforcing frames to fabricate bulk PDC composites and as conductive networks to improve the charge transport. Also, highly aligned rGO sheets endow PDC with more than one magnitude higher electrical conductivity in the longitudinal direction than that in the transversal direction. Such anisotropic electrical conductivity is due to the more efficient electron transport along graphene basal planes than that through the inter-plane hopping. Furthermore, rGO is capable of facilitating the transition from amorphous carbon to graphitic carbon in PDC composites by studies of Raman spectroscopy and X-ray diffraction.