College of Engineering
Department of
Mechanical & Industrial Engineering

The Robert W. Courter Seminar Series

3:00-4:00pm, Friday, February 22, 2019
1263 Patrick F Taylor Hall

New Paradigm in Manufacturing of Low-Cost Carbon Fibers and Multifunctional Polymer Matrix Composites

by Amit K Naskar*

Carbon & Composites Group, Oak Ridge National Laboratory

Transportation industries desire lightweight materials because they can increase fuel efficiency and reduce greenhouse gas emissions. Although lightweight, fiber-reinforced polymer matrix structural composite materials can offer significant advantages to the automotive industry, manufacturing protocols are not yet competitive with conventional processing methods such as metal stamping. We have adopted a concerted interdisciplinary research approach to overcome the barriers to realizing such technology. Our research approach involves new chemistry and processing methods of high yield carbon precursors, polymer matrix-reinforcing fiber interfacial engineering, high- and low-shear rheology of materials, tailoring performance based on application need and development of multifunctional self-sensing composites. We aim to control structures in multiphase soft matter matrix, consisting of a rigid reinforcing segment and a soft, flexible segment, with adequate interfacial adhesion between these two phases. This allows us to devise soft matter-based easy-to-process novel composites. This presentation will give an overview of our approach to enhance the performance and functionality of new fiber-reinforced composites. We are also interested in the conversion of renewables to engineered bioproducts and biocomposites with superior performance and 3D printability. These materials can have potential applications as structural and semi-structural components in an automotive, building, and other household applications. Successful industrial adoption and commercialization of our processes will also be presented.

* Dr. Amit K. Naskar is a senior research staff member and leader of the Carbon and Composites Group in the Oak Ridge National Laboratory's (ORNL) Chemical Sciences Division. His areas of research emphasis include chemistries of alternative carbon fiber precursors, sustainable polymeric materials, upcycling of biomass wastes, reactive extrusion of polymer and composites. Dr. Naskar is the lead inventor of the ORNL's technology for conversion of polyolefins into carbon fibers, high throughput manufacturing of commodity-grade carbon fibers, sustainable polymer formulations from lignocellulosic materials, and tailored carbon morphology for energy storage applications. He has authored well over 70 publications in peer-reviewed journals, has 15 issued patents, and was honored as Oak Ridge National Laboratory's Inventor of the Year, 2017.