



ME Seminar



3D shaping of carbon towards engineered living carbon materials

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ABSTRACT

Carbon microelectromechanical system (carbon MEMS) has emerged as a technique alternative to silicon-based MEMS technologies in the last two decades. Although carbon-MEMS allows for the fabrication of 3D carbon microstructures useful for several applications, complex architectures are still a major challenge. This presentation will discuss new curious ways to fabricate architectures of carbonaceous materials in different length scales. These techniques are patterning of functionalized biopolymer sheets, electrospinning, and 3D printing. Patterning of biopolymer sheets leads to a facile fabrication mechanism for obtaining 3D complex architectures of cellular carbonaceous materials, which exhibit high load carrying capabilities at a low density. This talk will discuss how the electrospun carbon nanofibers facilitate the patterning of nanostructures of different metal oxides, which are promising for several applications, including sensors and UV detectors. In this presentation, I will emphasize microstereolithographic 3D printing for fabricating 3D complex microarchitectures of glassy carbon, which exhibit excellent results in developing customizable tissue engineering scaffolds. The microstereolithographic approach further leads to the fabrication of 4D shape-morphing carbon architectures, which are currently being investigated for the eventual development of engineered living carbon materials.

ABOUT THE SPEAKER

Monsur Islam received his Bachelor of Engineering degree in Mechanical Engineering from Bengal Engineering and Science University, currently known as Indian Institute of Engineering Science and Technology, Shibpur in 2013. During his undergraduate program, he did summer research internships at Indian Institute of Technology (IIT) Kharagpur under the supervision of Prof. Suman Chakraborty and Prof. Amitabha Ghosh, and at University of California, Irvine under the guidance of Prof. Marc Madou. After graduation from IEST Shibpur in 2013, Monsur worked as a Research Associate at the Center for Nanoscience in IIT Kanpur under the supervision of Prof. Ashutosh Sharma. In 2014, Monsur joined the department of Mechanical Engineering at Clemson University in the United States as a PhD candidate under the supervision of Prof. Rodrigo Martinez-Duarte. The research activities during his PhD included microfabrication of carbon microelectrodes for healthcare diagnostics and advanced manufacturing of 3D porous carbonaceous materials. His research activities were recognized by the department and the University by awarding him the prestigious Hitachi High Technologies Electron Microscopy Fellowship, Doctoral Scholastic Award and Eastman Chemical Award. After earning the Ph.D. degree from Clemson in 2018, Monsur joined Prof. Jan Korvink's group at Karlsruhe Institute of Technology in Germany as a post-doctoral fellow. At KIT, Monsur is currently leading the research activities on the patterning of carbonaceous materials and developing research curriculum for engineered living materials. Till date, Monsur has published 31 journal articles, 14 conference proceedings and 3 book chapters and he has one US patent in his name. He is an active reviewer of leading scientific journals in his field.



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