



Biointerface Translation and Engineering Center

College of Engineering

UNIVERSITY OF GEORGIA

2026 Distinguished Seminar Series



Dr. Sudipta Seal

Pegasus Professor

University Distinguished Professor

Department Chair

Materials Science and Engineering

University of Central Florida

Friday, February 13th

10:20 am

**Driftmier Engineering Center
Room 1453 (Auditorium)**

Fun with Rare Earth Nanoenzymes in Angiogenesis

Angiogenesis is the formation of new blood vessels from existing blood vessels and is critical for many physiological and pathophysiological processes. In this study, we have shown that redox-active nanoparticles (Ce-NPs) from the lanthanide series induce angiogenesis, as observed in both in vitro and in vivo model systems. Lanthanides with unfilled f shells exhibit sharp, well-defined energy transitions and are often redox-active in select environments. We hypothesize that the mixed-valence state (Ce³⁺ + Ce⁴⁺) present in engineered cerium oxide nanoparticles will tune the generation of free radicals on demand. In particular, Ce-NPs trigger angiogenesis by modulating the intracellular oxygen environment and stabilizing hypoxia-inducing factor 1 α endogenously. Furthermore, correlations between angiogenesis induction and the physicochemical properties of Ce-NPs, including the surface valence-state ratio, surface charge, size, and shape, were examined. Atomistic simulations were also used to reveal the surface reactivity of NPs and to elucidate facile oxygen transport during the process.

Sudipta Seal, University Distinguished Professor and UCF Pegasus Professor, Distinguished Professor, UCF Trustee Chair, joined the Advanced Materials Processing and Analysis Center (AMPAC) and Mechanical Materials Aerospace Engineering at the University of Central Florida in Fall 1997 after a brief postdoctoral work at Lawrence Berkeley National Laboratory, University of California, Berkeley. He is currently the Chair of the UCF Materials Science and Engineering Department. At UCF, he pioneered nanostructured cerium oxide and other metal/oxide platforms (micro to nano) and discovered its antioxidant properties, applied it to various biomedical problems, and led to various patents in the area of regenerative nanostructures. His group is currently studying the biochemical interfaces of nanostructures and composites using various surface and electrochemical techniques to understand the redox properties responsible for their regenerative properties at the nanoscale. He is funded by DOD, NSF, NIH, NASA, SBIR programs, and numerous industries. H index 120, citation >60000. 94 issued patents. He is a Fellow of more than 10 societies, including ASM, AIMBE, NAI, MRS, etc., and a recipient of the 2002 ONR YIP award.