

UNIVERSITY OF CALIFORNIA, IRVINE

THE DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

Is Proud to Host a Seminar by:

ASSOCIATE PROFESSOR XIMIN HE

Dept. of Materials Science and Engineering
University of California, Los Angeles

Thursday, April 20, 2023

2:00-3:20 PM

Location:

McDonnell Douglas Engineering Auditorium

Bio-Like Soft Materials with Life-Like Intelligence

Abstract: From the cellular level up to the body system level, living organisms present elegant designs to realize the desirable structures, properties and functions. For example, tendons and muscles are tough but soft, owing to highly complex hierarchical structures rarely found in synthetic materials. Our neuromuscular system enables our motion sensing and response with built-in feedback control, presenting superior intelligence also lacking in manmade systems. Gels, as a class of liquid-laden crosslinked polymer networks, not only have tissue-like water-rich porous networks and can also change their volume and physical properties in response to environmental cues. At UCLA He lab, we exploit fundamental material processing-structure-property-function studies of hydrogels and their derivatives, to create (i) 'bio-like' structures and properties and (ii) 'life-like' intelligence in functional soft materials for applications in robotics, biomedicine, energy and environment. This talk will present how these could be realized by mastering polymer-water interactions. Specifically, using classic chemical physical principles to modulate macromolecule assembly up to complex polymer networks, the fundamental limits in mechanical, diffusion and electrical properties could be broken can be broken to design extreme properties. The enabled soft materials featuring high mechanical toughness, ion/electron conduction, fast stimuli response, and 'synthetic intelligence' make possible the next-generation energy-self-sufficient robots, personalized medical implants, as well as futuristic smart wearable electronics and battery-powered flight.

Bio: Ximin He is an associate professor of Materials Science and Engineering at University of California, Los Angeles (UCLA) and Faculty of California Nanosystems Institute (CNSI). Dr. He was postdoctoral research fellow in the School of Engineering and Applied Science and the Wyss Institute of Bioinspired Engineering at Harvard University. Dr. He received her PhD in Chemistry at Melville Laboratory for Polymer Synthesis from University of Cambridge. Dr. He's research focuses on bioinspired soft materials, structural polymers and their physical, mechanical, electrical and photothermal properties with broad applications in biomedicine, energy, environment and robotics. Dr. He is the recipient of the NSF CAREER award, AFOSR Young Investigator award, CIFAR Global Scholar, SES Young Investigator Medal, International Society of Bionic Engineering (ISBE) Outstanding Youth Award, Advanced Materials Rising Star Award, 3M Non-tenured Faculty Award, Hellman Fellows Award, and UCLA Faculty Career Development Award. Her research on bioinspired tough hydrogels, phototropic, phototoxic, homeostatic and anti-icing materials have garnered a number of regional and international awards and was featured in >100 international news outlets.