THE MATERIALS SCIENCE AND ENGINEERING DEPARTMENT
SPRING COLLOQUIUM SERIES PRESENTS:

PPG Lecture: Zhenan Bao

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Skin-Inspired Organic Electronics

Skin is the body's largest organ. It is responsible for the transduction of a vast amount of information. This conformable, stretchable, self-healable and biodegradable material simultaneously collects signals from external stimuli that translate into information such as pressure, pain, and temperature. The development of electronic materials, inspired by the complexity of this organ is a tremendous, unrealized materials challenge. However, the advent of organic-based electronic materials may offer a potential solution to this longstanding problem. Over the past decade, we have developed materials design concepts to add skin-like functions to organic electronic materials without compromising their electronic properties. These new materials and new devices enabled arrange of new applications in medical devices, robotics and wearable electronics. In this talk, I will discuss basic material design concepts for realizing stretchable, self-healable and biodegradable conductive or semiconductive materials. I will discuss our methods for scalable fabrication of stretchable electronic circuit blocks. Finally, I will describe a few examples of applications we are pursuing uniquely enabled by skin-like organic electronics when interfacing with biological systems, such as low-voltage electrical stimulation, high-resolution large area electrophysiology, "morphing electronics" that grows with biological system and genetically targeted chemical assembly - GTCA.

Zhenan Bao is Department Chair and K.K. Lee Professor of Chemical Engineering, and by courtesy, a Professor of Chemistry and a Professor of Material Science and Engineering at Stanford University. Bao founded the Stanford Wearable Electronics Initiate (eWEAR) in 2016 and serves as the faculty director. Prior to joining Stanford in 2004, she was a Distinguished Member of Technical Staff in Bell Labs, Lucent Technologies from 1995-2004. She received her Ph.D in Chemistry from the University of Chicago in 1995. She has over 700 refereed publications and over 100 US patents with a Google Scholar H-Index >185. Bao is a member of the National Academy of Engineering, the American Academy of Arts and Sciences and the National Academy of Inventors. She is a foreign member of the Chinese Academy of Sciences. She is a Fellow of MRS, ACS, AAAS, SPIE, ACS PMSE and ACS POLY. Bao was selected as Nature's Ten people in 2015 as a "Master of Materials" for her work on artificial electronic skin. She was the inaugural recipient of the VinFuture Prize Female Innovator 2021, the ACS Chemistry of Materials Award 2022, MRS Mid-Career Award in 2021, AICHE Alpha Chi Sigma Award 2021, ACS Central Science Disruptor and Innovator Prize in 2020, Gibbs Medal by the Chicago session of ACS in 2020, Wilhelm Exner Medal by Austrian Federal Minister of Science 2018, ACS Award on Applied Polymer Science 2017, L'Oréal-UNESCO For Women in Science Award in the Physical Sciences 2017, AICHE Andreas Acrivos Award for Professional Progress in Chemical Engineering in 2014, ACS Carl Marvel Creative Polymer Chemistry Award in 2013, ACS Cope Scholar Award in 2011, Royal Society of Chemistry Beilby Medal and Prize in 2009, IUPAC Creativity in Applied Polymer Science Prize in 2008. Bao is a co-founder and on the Board of Directors for C3 Nano and PyrAmes, both are silicon-valley venture funded start-ups. She serves as an advising Partner for Fusion Venture Capital.

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