

MSE Colloquium @ NTU

**23 April 2025 (Wed)****2:00 PM****LT 5 (NS2-02-07)****[Register here](#)**

Bioinspired Designs of Active and Sustainable Polymer Materials

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Abstract

Many biopolymers not only possess advanced mechanical properties such as high modulus, toughness, and elasticity, but more importantly, they exhibit dynamic characteristics like adaptability, malleability, and self-healing capabilities while remaining fully sustainable. Inspired by nature, the Guan lab has developed a range of biomimetic soft materials imbued with these active and dynamic properties. In one project, we have created chemical redox and electrochemical redox-fueled dissipative self-assembly of active materials. In another, we have advanced the development of sustainable polymers that are not only strong and self-healing but also malleable and recyclable, utilizing robust dynamic covalent chemistry. Recently, we have also developed a universal compatibilization strategy for recycling mixed plastic waste. The common thread in all these projects is establishing a direct connection between microscopic molecular properties and macroscopic bulk performance. In this talk, I will provide an overview of our design, synthesis, and property studies of these dynamic polymers, including adaptive, active, self-healing, and sustainable polymer materials.

Biography

Prof Zhibin Guan earned his B.S. and M.S. degrees from Peking University and completed his Ph.D. at the University of North Carolina, Chapel Hill. After a postdoctoral fellowship with Prof. Frances Arnold (Nobel laureate 2018) at Caltech and a brief tenure at DuPont, he joined the Department of Chemistry at UC Irvine as an assistant professor in 2000. He was promoted to Associate Professor with tenure in 2004 and to Full Professor in 2006. Since 2006, he has also been affiliated with the Departments of Biomedical Engineering, Chemical and Biomolecular Engineering, and Materials Science at UC Irvine. His research interests encompass polymerization catalysis, bioinspired polymer design, self-healing and sustainable polymer materials, and functional biomaterials for RNA delivery. His research has been recognized with several prestigious awards and fellowships, including the Japan Society for the Promotion of Science (JSPS) Fellowship, the Humboldt Bessel Research Award, the Camille Dreyfus Teacher-Scholar Award, the NSF CAREER Award, the Beckman Young Investigator Award, and his election as a Fellow of the American Association for the Advancement of Science. His work has been widely featured in scientific journals and major media outlets such as C&EN News, The Washington Post, The Wall Street Journal, The Los Angeles Times, CNN, and Forbes. He also served as Chair of the 2018 Bioinspired Materials Gordon Research Conference in Les Diablerets, Switzerland.