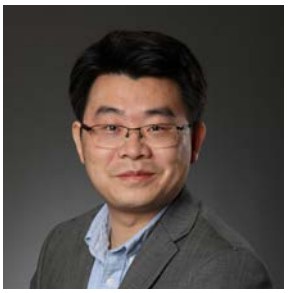
UC San Diego
JACOBS SCHOOL OF ENGINEERING
NanoEngineering

UC SAN DIEGO NANOENGINEERING SEMINAR

Wednesday, April 24th, 2019
Seminar Presentation: 11:00am – 12:00pm
SME 248

"Design Smart Materials via Additive Manufacturing"

Dr. Qiming Wang
Assistant Professor
Department of Civil and Environmental Engineering
University of Southern California



Abstract: Designing new materials is a long-lasting endeavor of modern engineering. The emerging additive manufacturing technologies offer new opportunities for designing unprecedented materials. Here we present several design strategies for smart materials using a state-of-the-art stereolithography-based additive manufacturing system. (1) The first strategy is to harness 3D architectures of active materials. Stimuli-responsive bulk materials have enjoyed wide applications where on-demand external controls can be applied. Here we show how to tailor 3D magnetoactive lattice structures to enable rapid, remote, and reversible control of acoustic transportation properties. (2) The second strategy is to integrate smart groups in the molecular scale of the 3D-printable material. Self-healing materials have been enabling promising applications from electronics to robotics; however, additive manufacturing of self-healing structures is challenging. The primary reason is that self-healing and additive-manufacturing (e.g., photopolymerization-based) require different chemical groups. We show that molecular-scale integration of two chemical groups can enable rapid additive manufacturing of 3D-architected healable structures for robots, electronics, and lightweight lattice structures. (3) The third strategy is to composite several distinct materials into a single architecture. Traditional composite industries usually fabricate bulk multiphase composites; we here present lightweight cellular structures with two distinct phases to enable unconventional negative thermal expansions.

Biosketch: Qiming Wang is an Assistant Professor in the Department of Civil and Environmental Engineering of the University of Southern California. Prior to this position, he was a Postdoctoral Fellow at Massachusetts Institute of Technology working with Professor Nickolas X. Fang. He earned his Ph.D. degree in Mechanical Engineering and Materials Science at Duke University, working with Professor Xuanhe Zhao. He won AFOSR Young Investigator Award in 2017, MRS Graduate Student Award in 2014, ACS Arthur K. Doolittle Award in 2014, NIH-Duke Kewaunee Student Achievement Award in 2013, NIH-Duke Lew Pre-doctoral Fellowship in 2012, and ASME Best Student Paper Award in 2011. He was elected as the Editor (2018) of ASME Technical Committee of Mechanics of Soft Materials and become Secretary in 2019, Vice Chair in 2020, and Chair in 2021. He has been an organizer of various symposia, including SES mechanics of highly deformable bodies 2016-2018, APS physics of bioinspired materials 2016-2017, EMI mechanics of soft materials 2017-2018, and ASME Mechanics of 3D-printed materials 2017-2018. His recent research interests are centered around additive manufacturing and mechanics of unprecedented materials and structures that can potentially address grand engineering challenges including resilient structures and clean water. His research has been widely reported by Science News, Nature News, Discovery, Washington Post, NBC News, Wall Street Journal, Physics Today, Materials Today, and NASA Tech Briefs.