

October 29, 2025 | 180 Snell Engineering Center | 12:00PM

Distinguished Seminar Speaker

Developing Soldering Nanomaterials for Advanced Materials Joining and Bonding

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Abstract: Joining and bonding methods are not only necessary, but also quite often critical in materials forming and electronic device manufacturing processes. Among various joining methods, soldering is one of the most widely used ones, due to its electrical conductivity and mechanical reliability, which makes it widely used in a variety of applications such as electronics, sensors, transportation vehicles, and biomedical devices. In this presentation, I will show the synthesis and development of soldering-driven nanomaterials, including both nanoparticles and nanowires, for a variety of micro/nanoscale bonding and joining applications: (1) low-temperature lead-free nanosolders have been synthesized and applied for Cu-Cu joining and bonding; (2) site-selective core/shell and multi-segment nanowires have been synthesized by a combined electrodeposition and chemical reduction method, which can be aligned and assembled by external force field such as magnetic field or electrical field, before subsequent soldering. These nanoparticles and nanowires, and the associated nano-soldering techniques, have shown great promise in the assembly and construction of functional nanoelectronics and nanodevices.

Biography: Dr. Zhiyong Gu is currently a Professor and Chair of the Department of Chemical Engineering at the University of Massachusetts Lowell. He received his Ph.D. from the State University of New York at Buffalo in 2004, and worked as a Postdoctoral Fellow in the Department of Chemical and Biomolecular Engineering at the Johns Hopkins University from 2004 to 2006. In September 2006, he joined UMass Lowell as an Assistant Professor, was promoted to Associate Professor with Tenure in September 2012, and then promoted to Full Professor in September 2017. He served as the Graduate Coordinator and then Associate Chair from 2012 to 2023. His research interests include synthesis of nanoparticles and nanowires, lead-free nanosolders, self-assembly, nanocomposite materials, and nanoscale joining and packaging for electronics, sensors, and biomedical applications. He has published 5 book chapters and over 80 peer-reviewed journal papers, and contributed to over 200 conference presentations. He received the 3M Non-Tenured Faculty Award in 2010, Department Teaching Excellence Award in 2011, US EPA People, Prosperity and the Planet (P3) Award in 2015, and Outstanding Mentoring of Undergraduate Students Award in 2018. He is currently an Associate Editor for the Journal of Nanoparticle Research, served as an Associate Editor for the Journal of Electronic Materials from 2015 to 2020, and served on the Editorial Advisory Board of several other journals.