

Polymer Webinar

11:15 am, October 17, 2025

Online — Teams [LINK](#)

Host: Yi Zhang

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From Bioresorbable Batteries to Miniaturized Biomedical Devices for Electrotherapy and Drug Delivery

Abstract: Programmable medical devices typically include power sources, sensing/therapeutic interfaces, communication hardware, and associated electronics, which often require invasive surgical implantation and extraction. In this talk, I will introduce our miniaturized biomedical devices, designed to overcome key limitations of conventional systems. I will first present our studies on bioresorbable galvanic cells and batteries. Next, I will introduce a galvanic-cell-based, self-powered optoelectronic platform for developing miniaturized devices. Examples include a millimeter-scale cardiac pacemaker and a compact drug delivery device. The constituent materials are bioresorbable, naturally degrading after a defined period of stable operation in the human body. Studies of various bioresorbable electrode materials guide optimized design choices. Programmability relies on the use of external light sources to illuminate wavelength-sensitive phototransistors using a wavelength-division multiplexing strategy. *In vivo* demonstrations of multi-site cardiac pacing and programmed release of lidocaine in small and large animal models illustrate the platform's functionality for electrotherapy and drug delivery. This platform can be readily adapted for a broad range of future biomedical applications.

Bio: Yamin Zhang is an Assistant Professor under the Presidential Young Professorship in the Department of Chemical & Biomolecular Engineering and the Department of Biomedical Engineering at the National University of Singapore. Her research centers on 'electrochemtronics', integrating electrochemical systems with biological tissues to create innovative healthcare solutions. She has authored over 30 publications, including *Nature*, *Nature Biomedical Engineering*, *PNAS*, and other high-impact journals. She serves on the Advisory Board of *Cell Biomaterials* and the Early Career Advisory Board of *ACS Applied Materials & Interfaces* and *Chem & Bio Engineering*. Her contributions have been recognized with international honors such as the MIT TR35 Innovators (2025) and the MIT ChemE Rising Star (2022).

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