

# Shrink Polymer Biosensors: Manufacturing from Micro to Nano

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**Date: Friday, February 28, 2025 17:00-18:00**

**Venue: Faculty of Engineering Bldg. 2, Room 31A**

#### Abstract:

Polymer shrinkage offers a novel approach for generating smaller structures by reforming larger pre-patterned ones, enabling nanolithography for manufacturing patterns that transition from the microscale to the nanoscale. This facile fabrication method, which combines embossing with thermoplastic shrinkage, aims to reduce feature sizes while significantly increasing the aspect ratio of imprinted microstructures. The shrinkage capability is achieved through low-temperature molding for shorter cycle times, followed by high-temperature activation to induce shrinkage. Both two- and three-dimensional embossed structures have been successfully reduced to much smaller scales. This polymer-shrinking process expands the fabrication capabilities of polymer embossing, making it a valuable tool for MEMS-based biosensors. This talk will highlight research from the Cui Lab in three key areas: shrink nanomanufacturing, the integration of “bottom-up” nano self-assembly with “top-down” manufacturing, and piezoelectric actuators for chemical sensing and electronics cooling. A particular focus will be presented on shrink nanowrinkle structures, shrink polymer nanolithography, and ultra-sensitive shrink biosensors for medical applications to cancer diagnostics.



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**Dr. Tianhong Cui** is currently a Distinguished McKnight University Professor at the University of Minnesota. He is a Professor in Mechanical Engineering and an Affiliate Senior Member of the graduate faculty in Electrical Engineering and Biomedical Engineering. He is a member of the European Academy of Sciences and Arts. He is a Global Chair Visiting Professor at the University of Bath, a Visiting Fellow at the University of Cambridge, and an Adjunct Professor at Mayo Clinic. He is a Fellow of American Society of Mechanical Engineering (ASME). He was a Laureate of Blaise Pascal Chair for Excellence through École Normale Supérieure in France, and a Distinguished Visiting Fellow of Royal Academy of Engineering in the UK. He is serving as an Executive Editor-in-Chief for the first engineering journal of Nature, *Microsystems & Nanoengineering*, and is an Editor-in-Chief for the first AAAS/Science Partner Journal, *Research*. He was the founding Editor-in-Chief of another Nature journal, *Light: Science & Applications*.

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