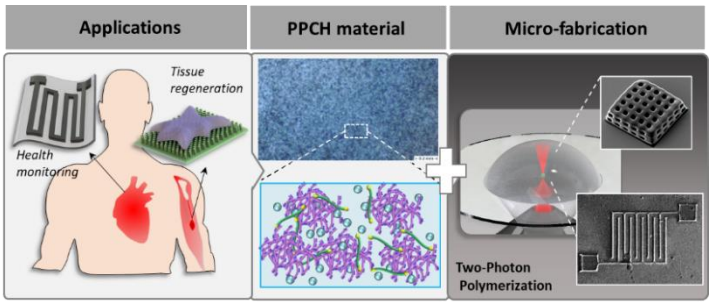
3D Printing of PEDOT:PSS/PEO Conductive Hydrogels using Two-photon Polymerization

Ketki M. Lichade[1], **Yayue Pan**[2], the presenter's name is **bolded and underline**

[1,2] *Department of Mechanical and Industrial Engineering, University of Illinois at Chicago, United States*

Abstract

Conductive hydrogels made of Poly(3,4-ethylenedioxythiophene):poly(styrene sulfonate) (PEDOT:PSS) have been widely investigated for bioelectronics and tissue engineering applications, considering their high electrical conductivity and the ability to interface with soft biological tissues. However, the manufacturing of PEDOT:PSS-based hydrogel devices has mostly relied on conventional techniques such as casting and transfer printing, which limit the geometry complexity and restrict the object feature size to meso-/micro- scale. To address these limitations, this work investigated the hydrogel formulations using blends of PEDOT:PSS and Poly(ethylene oxide) (PEO) and the processability of the PEDOT:PSS/PEO hydrogels in Two-Photon Polymerization (TPP) process. This talk will present a novel PEDOT:PSS/PEO conductive hydrogel (PPCH) and demonstrate successful fabrications of high-resolution 3D structures using the PPCH material and the TPP process. The prepared PPCH hydrogel exhibited enhanced swelling, electrical conductivity, and biocompatibility, compared to the pristine PEDOT:PSS material. The effectiveness of nano/micro-manufacturing of PPCH using the TPP process was validated using various three-dimensional (3D) models, including a UIC logo, a micro-capacitor array, and a tissue regeneration scaffold. The test cases demonstrated many promising properties, including high electrical conductivity, good biocompatibility, nano/micro-scale resolution, and excellent mechanical stability. The experimental results imply new possibilities for energy storage devices, flexible micro/nanoelectromechanical systems, and flexible biomedical micro-devices.



Biography of Presenter

Dr. Yayue Pan is an Associate Professor in the Department of Mechanical and Industrial Engineering at the University of Illinois at Chicago (UIC). Her research focuses on multi-material and multi-scale Additive Manufacturing processes for applications in sensing and actuating devices, functional films, energy management and storage. Some of her recent awards include 2017 SME Outstanding Young Manufacturing Engineer Award, 2019 UIC College of Engineering Outstanding Teaching Award, and 2020 ASME CIE TC Leadership Award.