

Polymer Program

2021 Fall Webinar Series

Friday, October 22, 11:10 am

Webex Link: <https://uconn-cmr.webex.com/uconn-cmr/j.php?MTID=m09e9285a80bec0d55b5ae062538a7ef8>

“Polymer based mixed conductors for applications in bioelectronics”

Prof. Jonathon Rivnay

Northwestern University

Abstract:

Direct measurement and stimulation of ionic, biomolecular, cellular, and tissue-scale activity is a staple of bioelectronic diagnosis and/or therapy. Such bi-directional interfacing can be enhanced by a unique set of properties imparted by organic electronic materials. These materials, based on conjugated polymers, can be adapted for use in biological settings and show significant molecular-level interaction with their local environment, readily swell, and provide soft, seamless mechanical matching with tissue. At the same time, their swelling and mixed conduction allows for enhanced ionic-electronic coupling for transduction of biosignals. Structure-transport properties allow us to better understand and design these active materials, providing further insight into the role of molecular design and processing on ionic and electronic transport, charging phenomena, and stability for the development of high performance devices. Such properties stress the importance of bulk transport processes, and serve to enable new capabilities in bioelectronics, including new device concepts and form factors. I will demonstrate how such materials properties relax design constraints, allowing for flexible amplification systems for electrophysiological recordings. I will further demonstrate the design of non-volatile artificial synapses that take advantage of ion complexation to achieve neuromorphic function for future applications in sensor fusion. New materials design continues to fill critical need gaps for challenging problems in bio-electronic interfacing.

Bio:

Jonathan Rivnay is an Assistant Professor in the Department of Biomedical Engineering at Northwestern University. Jonathan earned his B.Sc. in 2006 from Cornell University. He then moved to Stanford University where he earned a M.Sc. and Ph.D. in Materials Science and Engineering, studying the structure and electronic transport properties of organic electronic materials. In 2012, he joined the Department of Bioelectronics at the Ecole des Mines de Saint-Etienne in France as a Marie Curie post-doctoral fellow, working on conducting polymer-based devices for bioelectronics. Jonathan spent 2015-2016 as a member of the research staff in the Printed Electronics group at the Palo Alto Research Center (PARC, a Xerox Co.) before joining the faculty at Northwestern in 2017. He is a recipient of the Faculty Early Career Development (CAREER) award from the National Science Foundation (2018), and a research fellowship from the Alfred P. Sloan Foundation (2019), and was named a Materials Research Society Outstanding Early Career Investigator (2020).

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