Electronics at the Edge: Flexible, Hybrid and Additive Approaches to Medical and Industrial Devices

Flexible and hybrid electronics (FHE) combine additively printed electronics on bendable, flexible, or highly stretchable substrates with the performance of thinned silicon-based semiconductors to enable applications that include wearable medical devices and industry sensors. This presentation will review the design and fabrication challenges associated with interfacing hard and soft electronic components, sustainability and materials selection, printing, processing, and testing of FHE systems. Enabling features include the use of highly stretchable conductors, fluid transport and analysis, printed RF devices, power conversion, and efforts to enable use at extreme conditions that include high temperature, power and current operation will be described. Device "concepts of operation" will guide the evaluation of performance and reliability. Outcomes from this work are expected to inform the eventual scale-up to large area, roll-to-roll manufacturing or integration on complex, non-planar surfaces, and solids.

Mark D. Poliks is a SUNY Distinguished Professor of Materials Science and Engineering and Systems Science and Industrial Engineering at the Thomas J. Watson College of Engineering and Applied Science, Binghamton University, State University of New York. He is the founding director of the Center for Advanced Microelectronics Manufacturing (CAMM), a New York State Center of Advanced Technology and home to the New York Node of the federally supported NextFlex Manufacturing USA. Poliks has made sustained contributions to the fields of electronics packaging, flexible and hybrid electronics that are relevant to a variety of medical and industrial applications. He has had significant experience in the electronics industry serving as a senior technical manager at the IBM Corporation and as director of R&D at Endicott Interconnect Technologies, Inc. He was the General Chair of the 69th IEEE Electronic Components and Technology Conference (ECTC). He is a Fellow of NextFlex, an elected member of the IEEE Electronics Packaging Society (EPS) Board of Governors, serves as the director of student programs and is an IEEE EPS Distinguished Lecturer.