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Manufacturing of Flexible Hybrid Electronics – from Silicon Wafers to Flexible Plastic and Glass

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ABSTRACT:

Methods to integrate electronic devices and manufacture on rigid silicon wafers are well established. Device dimensions have continued to shrink and performance continues to increase each year, however advancements in electronics packaging and heterogeneous integration have been identified as key to achieving "More than Moore." The use of creative manufacturing methods involving the direct attachment of thin silicon die on flexible substrates (chip-on-flex) have enabled high performance and reliability in truly non-traditional miniature sized systems. Electronic function on flexible substrates will offer dramatically new approaches to traditional applications that include: health monitoring, diagnostic medicine, sensors, communications, imaging, information displays, lighting, power and solar energy conversion. This talk will examine how some of the basic semiconductor manufacturing processes can be adapted for use with flexible substrate materials and suggest means for manufacturing flexible hybrid electronics systems in the future. Advancements in manufacturing processes such as substrate and roll-to-roll handling, slot-die coating, aerosol jet printing, vacuum deposition, photolithography, wet processing and thin silicon placement will be described.

BIOGRAPHY:

Mark D. Poliks is Empire Innovation Professor of Engineering, Professor of Systems Science and Industrial Engineering and Director of the Center for Advanced Microelectronics Manufacturing (CAMM) at the State University of New York at Binghamton. He holds joint faculty appointment in the Materials Science and Engineering Program at Binghamton. His research is in the areas of high performance electronics packaging, flexible hybrid electronics, materials, processing, roll-to-roll manufacturing, in-line quality control and reliability. He is the recipient of the SUNY Chancellor's Award for Excellence in Research. He leads the New York State NextFlex activities and was named a 2017 NextFlex Fellow. He has authored more than one-hundred technical papers and holds forty-six US patents. Previously he held senior technical management positions at IBM Microelectronics and Endicott Interconnect. Poliks is a member of technical councils for the FlexTech Alliance, the Nano-Bio Manufacturing Consortium (NBMC) and NextFlex, and has served on the NextFlex Governing Council. He serves as the General Chair of 69th IEEE/EPS Electronics Components and Technology Conference (ECTC) and recently co-organized a National Science Foundation/NextFlex Workshop on "Accelerating Innovative Manufacturing Technologies for Flexible Hybrid Electronics"