Washington University in St. Louis

SCHOOL OF ENGINEERING & APPLIED SCIENCE

Preston M. Green Department of Electrical & Systems Engineering

Seminar Announcement

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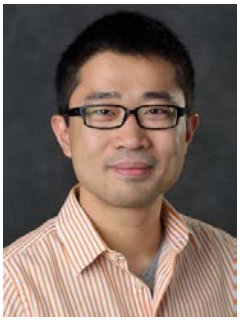

Friday, April 14, 2017
Green Hall, Room 0120
10:00 A.M.

Fully-printed Stretchable Electronic Devices, Circuits, Sensors, and Displays

Abstract: Stretchable electronic systems built on soft elstomeric substrates offer more conformal surface coverage and better durability than flexible electronics, and have generated significant research interests recently for potential applications in wearable/implantable health monitoring and diagnostic devices, electronic skin for prosthesis or soft robotics, stretchable displays and many more. Nevertheless, the large-area and low-cost fabrication of high-performance intrinsically stretchable electronic devices has remained to be extremely challenging. In this talk, I will present our recent work on addressing the two major challenges faced by stretchable electronics - the development of intrinsically-stretchable electronic materials and the need for scalable fabrication processes. We have developed nanomaterials-based metal, semiconductor, and dielectric materials with superior electronic property, stretchability, and inter-layer adhesion. Such materials are formulated as electronic inks to allow highly uniform and scalable material patterning using an inkjet-printing process, allowing us to achieve intrinsically stretchable thin-film transistors (TFTs) and integrated logic circuits made entirely by printing on ultrathin elastic polydimethylsiloxane (PDMS) substrates. Electrical and mechanical characterizations reveal that the TFTs and logic circuits can withstand up to 100% tensile strain along either channel length or channel width directions for thousands of cycles while showing no noticeable degradation in electrical performance. In addition to the above, I will also present our work on printed stretchable sensors (pressure, strain, and temperature), photodetectors, and displays. Our platform may offer a new entry into more sophisticated stretchable electronic systems with monolithically integrated sensors, actuators, and displays, fabricated by scalable and low-cost methods for real-life applications.

Bio: Dr. Chuan Wang joined Michigan State University as an assistant professor of Electrical and Computer Engineering in 2013, where he founded the Flexible Electronics Group. Prior to joining MSU, he received a B.S. in Microelectronics from Peking University in 2005 and a Ph.D. in Electrical Engineering from University of Southern California in 2011. From 2011 to 2013, he worked as a postdoctoral scholar in the department of Electrical Engineering and Computer Sciences at the University of California, Berkeley with a joint appointment in the Materials Sciences Division at Lawrence Berkeley National Laboratory. Dr. Wang's current research directions include: 1) Stretchable electronics for displaying, sensing, and energy harvesting applications; 2) Two-dimensional semiconductors for nanoelectronics and optoelectronics; and 3) Conversion between electrical, optical, and mechanical energies. He has published over 50 journal papers with around 3000 citations and an h-index of 26. He is one of the associated editors for Nanoscale Research Letters and also serves as an editorial board member for Scientific Reports.

Host: R. Martin Arthur