Nanomanufacturing Faculty Candidate Seminar

Monday March 9, 2015 at 11:00 AM

Birck Nanotechnology Center Rm 1001

Chi Hwan Lee

Title: Advanced Nanomanufacturing Processes: Fabricating Thin Film Electronics on Unusual Substrates

Bio: Dr. Chi Hwan Lee received M.S. (2009) and Ph.D. degrees (2013) in Mechanical Engineering at Stanford University, and double B.S. degrees (2007) in Mechanical Engineering and Industrial Engineering at Illinois Institute of Technology and Ajou University (Korea) through dual degrees program. His Ph.D. research with Professor Xiaolin Zheng involves developments and fundamental studies of advanced nanomanufacturing processes for the fabrication of thin film devices on flexible, transparent and/or ultrathin substrates using nanomaterials as semiconducting components. His current research from August 2013, as a postdoctoral research associate in Professor John A. Rogers Research Group at University of Illinois at Urbana-Champaign, aims to explore novel design layouts, materials, mechanics and processes for bioresorbable thin film devices which can be functional with high performances for preprogrammed time frames but then completely disappear naturally in the body via chemical resorption. Practical applications using the bioresorbable devices include biomedical sensors and drug delivery vehicles.

Abstract: Thin film electronics consist of semiconductor layer as well as dielectric layer and metallic contacts which are deposited over a supporting substrate, commonly glass or wafer. Fabrication of the thin film electronics on unusual yet useful substrates, such as papers, rubbers, plastics and clothes, could offer tremendous advantages of flexibility, stretchability,wearability, low cost and/or light-weight in actual use. However, the unusual substrates severely suffer from the incompatibility issues with existing fabrication processes/facilities due to their low thermal/chemical resistance and high surface roughness.This talk introduces advanced nanomanufacturing processes enabling the fabrication of thin film electronics on a broad range of unusual substrates. Examples of system-level demonstrations include ‘paper solar cells’,‘ultrathin nanosensors’, ‘skin-likesensors’ and ‘bioresorbable drug delivery vehicles’ by choosing their supporting substrates according to the desired applications. Exploiting high quality of semiconducting nanomaterials, such as silicon-based nanowires and nanomembranes,facilitates to achieve high performances comparable to those of the state-of-art devices that are fabricated on conventional rigid, flat substrates. This talk also covers the results of mechanism studies to understand basic working principles of underlying mechanicsand chemical reactions in the nanomanufacturing processes, which could lead to further improvements in simplicity, scalability and yields.