

Center for Human-Centric Interfaces & Engineering Guest Lecture

December 1, 2020 | 11AM EST

FLEXIBLE AND DEFORMABLE ELECTRONICS USING STRAIN-ENGINEERED VAN DER WAALS MATERIALS

SungWoo Nam | Associate Professor and Anderson Faculty Scholar; Mechanical Science and Engineering, University of Illinois at Urbana-Champaign

Link: <https://tinyurl.com/CHCIEgl1>

Abstract: Many mechanical deformations, such as buckling, wrinkling, collapsing, and delamination, are usually considered as threats to mechanical integrity and are avoided or reduced in the traditional design of materials and structures. My work goes against these conventions by tailoring such mechanical instabilities to create strain-engineered functional morphologies. We use ultralow bending stiffness and semiconducting properties of atomically-thin van der Waals (vdW) materials to enable strain-engineered properties and device-level multifunctionalities that extend beyond those of bulk material systems. In this talk, I will present our research on strain engineering of two-dimensional (2D) vdW materials, and the new and reconfigurable material properties exhibited in such deformed and strain-engineered materials. First, I will introduce controlled mechanical deformation of 2D materials, and the wide range of strain-engineered properties engendered by these deformed materials, such as strain-engineered exciton transport (i.e., exciton strain-tronics). Furthermore, I will present our work on interfacial control using vdW materials to modulate fracture modes of thin films to enable a new phenomenon of strain resilient electrical functionality for flexible electronics. These mechanical instability-induced modulations of materials at the atomic level will open the door to unconventional and reconfigurable properties for applications in next generation deformable electronics and quantum devices.

Bio: Dr. Nam is an Associate Professor and Anderson Faculty Scholar in the Department of Mechanical Science and Engineering (MechSE) at University of Illinois at Urbana-Champaign (UIUC). He received a B.S. degree in Materials Science and Engineering from Seoul National University. Following three years of industry experience in carbon nanotube (CNT) processing, he obtained his M.A. in Physics (2007) and Ph.D. in Applied Physics (2011) from Harvard University. After his Ph.D., he worked as a postdoctoral research associate at University of California, Berkeley. Dr. Nam is the recipient of The Minerals, Metals and Materials Society (TMS) Early Career Faculty Fellow Award, NSF CAREER Award, two DoD (AFOSR and ONR) Young Investigator Program (YIP) Awards, NASA Early Career Faculty (ECF) Award, UIUC Center for Advanced Study Fellowship, UIUC Campus Distinguished Promotion Award, UIUC Engineering Dean's Award for Excellence in Research, UIUC Engineering Rose Award for Teaching Excellence, and UIUC Engineering Council Award for Excellence in Advising.



For information on future events, or the HCIE Center, Contact Center Director: Dr. W. Hong Yeo
Email: chcie@me.gatech.edu | **Web:** <http://chcie.me.gatech.edu>