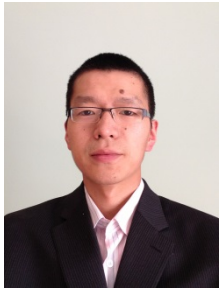

Yajie Dong
PhD, Harvard University

Host: Elizabeth Podlaha-Murphy
podlaha@coe.neu.edu

"Semiconductor Nanomaterials for Information and Energy Technologies"

Thursday, May 1
315 Behrakis (BK)
11:00 am – 12:00 pm

Refreshments will be served

ABSTRACT Low dimensional nanomaterials (1 D nanowires and 0 D quantum dots) represent important nanoscale building blocks with substantial potential for exploring new device concepts and materials for nanoelectronics, optoelectronics and energy technology applications. Three examples will be presented. First, I will discuss my discovery of unique rectified silver/amorphous silicon/crystalline silicon (Ag/a-Si/c-Si) crossbar resistive random access memory (RRAM) effect in c-Si/a-Si core/shell nanowires and provide a comprehensive comparison between nanowire based and planar silicon based Ag/a-Si/c-Si RRAMs. The history of how this accidental nanowire based discovery solved a decades-long sneak current problem in RRAM field and eventually evolved into a game changing mainstream flash memory successor, Crossbar Memory, will be presented. Then I will report the experimental realization of high efficiency single coaxial group III-nitride heterostructured nanowire photovoltaic devices and light emitting devices. Meanwhile, a universal van der Waals epitaxial growth strategy for compound semiconductor nanowire arrays will be discussed. The vision of how the combination of nanowire array growth and heterostructured nanowire devices could possibly change the substrate limited status of III-Nitride research fields will be outlined. Lastly, I will present how quantum dots materials innovation and novel device structure design/processing helped resolve one long standing issue for organic based light emitting devices, the efficiency roll off at high driving current density. As a result, record breaking ultrabright, highly efficient, low roll off inverted red quantum dot light emitting devices (QLEDs) have been achieved (165,000Cd/m^2 at <6V driving voltage). Strategies to attack the only remaining issue (long term instability) of QLEDs will be discussed in the end.

BIOGRAPHY: Dr. Yajie Dong is an experienced nanotechnology researcher. In 2010, he graduated from Prof. Charles Lieber's group at Chemistry and Chemical Biology Department of Harvard University. From 2010 to 2012, he was a postdoctoral associate working with Professors Yet-Ming Chiang and W. Craig Carter in the department of Materials Science and Engineering at the Massachusetts Institute of Technology. Ever since then, he worked as a Senior Scientist for QD Vision Inc., a Nanotech Startup based on research of Professors Moungi Bawendi and Vladimir Bulovic's groups at MIT and located in Lexington, MA. He is broadly interested in materials challenges in nanoelectronics, optoelectronics and energy technologies, particularly in nanoscale nonvolatile resistive switches for information processing and storage, compound semiconductor nanowires or quantum dots based high efficiency energy conversion devices and new battery materials and architectures for large scale energy storage.