**Graphene-based Layer Transfer & Crystalline-based ReRAM**
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In this talk, I will introduce my group's research activity in nanoelectronics. First, we will discuss our recent development in a "graphene-based layer-transfer" process that could offer (1) reusability of the expensive substrate, (2) minimal substrate refurbishment step after the layer release, (3) fast release rate, and (4) precise control of a released interface. We have utilized epitaxial graphene as a universal seed layer to grow single-crystalline III-N, III-V, II-VI and IV semiconductor films as well as a release layer that allows precise and repeatable release at the graphene surface. I will discuss about our recent success in developing the pathway to obtain single-crystalline III-V on graphene.

Lastly, I will introduce our new research activities in developing advanced RRAM devices. Resistive switching devices have attracted tremendous attention due to their high endurance, sub-nanosecond switching, long retention, scalability, low power consumption, and CMOS compatibility. RRAMs have also emerged as a promising candidate for non-Von Neumann computing architectures based on neuromorphic and machine learning systems to deal with "big data" problems such as pattern recognition from large amounts of data sets. However, currently reported RRAM devices have not shown uniform switching behaviors across the devices with high on-off ratio which holds up commercialization of RRAM-based data storages as well as demonstration of large-scale neuromorphic functions. Recently, we redesigned RRAM devices and this new device structure exhibits most of functions required for large-array memories and neuromorphic computing, which are (1) excellent retention with high endurance, (2) excellent device uniformity, (3) high on/off current ratio, and (4) current suppression in low voltage regime. I will discuss about the characterization results of this new RRAM device.