



**Hybrid van der Waals heterostructures
composed of conventional semiconductors
and two-dimensional materials**

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**Materials
Engineering
MSE 690
Fall 2019
Seminar Series**

**Thursday, Oct. 10th
12:00 pm Pizza Lunch
& Discussion
12:30 pm Seminar &
CINT Capability
ARMS 3109**

Abstract: Emerging nanomaterials have attracted much attention due to their novel functionalities, but have also been hindered by lack of scalable synthesis and of ways of controlling characteristics. Atomically thin two-dimensional (2D) materials are good examples of novel materials set promising exotic properties and requiring established manufacturing approaches for practical applications. Heterostructuring is a powerful and general strategy to control physical properties of materials. Moreover, heterostructuring can offer novel characteristics differentiating the heterostructure from individual component in a structure. Recently, 2D/2D heterostructures prepared by stacking are being explored to observe quantum phenomena. However, fabrication of 2D/2D heterostructures has been limited by difficulty in preparation of individual 2D layers in controlled manner. Heterostructuring with 2D and conventional materials in other dimensions (e.g. bulk-like structure for 3D and nanowires for 1D) has shown great potential for multi-dimensional heterostructures.

In this presentation I'll discuss how to prepare multi-dimensional heterostructures composed of 2D and conventional materials. The experimental approach is epitaxial growth Si, Ge, and ZnO on various 2D materials including graphene, hexagonal boron nitride, transition metal dichalcogenides. Absence of surface dangling bonds on a 2D material provides a unique opportunity to overcome materials compatibility issues. Nucleation strategy and novel characteristics of multi-dimensional heterostructures will be discussed in detail.

Biography: Jinkyong Yoo is the co-leader of Quantum Materials Systems thrust of The Center for Integrated Nanotechnologies (CINT), a National Nanoscience Research Center supported by U.S. Department of Energy, in Los Alamos National Laboratory. Jinkyong received his Ph. D. (Materials Science) from the Pohang University of Science and Technology (POSTECH) in South Korea. He worked at CINT as a post-doctoral researcher from 2010 to 2013. He then joined CINT as a technical staff member in 2013. His research encompasses synthesis of semiconductor nanowire heterostructures, 2D/3D heterostructures, electrical/optical characterizations, and device fabrication to integrate fundamental understandings of nanoscience into applicable devices.