**Materials Research Seminar**

**Texas Center for Superconductivity at the University of Houston**

**Center for Integrated Bio and Nano Systems**

# Interface Engineering of van der Waals Heterostructures for Optoelectronics

**October 25, 2024**

Face to Face Only: 1:00 – 2 :00 pm

Location: HSC 102


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**Materials Science and NanoEngineering**

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**Abstract**:

Manipulation of charge carriers at the semiconductor interfaces is the basis of modern electronics. In contrast to conventional materials, van der Waals (vdW) materials release constraints on designing atomically sharp interfaces, creating additional degrees of freedom in interface engineering. Here, I will focus on interlayer interactions between vdW materials and discuss how we can engineer vdW interfaces to (i) enable advanced optical characterization beyond diffraction limit and (ii) improve monolayer semiconductor device performance. (i) vdW heterostructures with quantum well band alignment enable to measure cathodoluminescence in monolayers, which has been challenging due to their atomic thinness. This will reveal precise structure-property relationships at the nanoscale. (ii) 3D/2D and 2D/2D interface interactions modify work function and doping, reducing contact resistance by orders of magnitude, which is a prerequisite for the practical applications.


**Bio:** HaeYeon Lee is an Assistant Professor at Rice University, in the Materials Science and Nanoengineering department. Before starting her own group in January 2024, she was a postdoctoral research scientist at Columbia University in Prof. James Hone's group. She completed her Ph.D. degree at Massachusetts Institute of Technology (MIT) in 2021. She was in Prof. Silvija Gradečak and Frances Ross group and she was a Samsung Scholarship fellow. HaeYeon's research focuses on exploring the optoelectronic and photonic properties of low-dimensional quantum materials at the nanoscale to control their properties and develop devices for next generation electronic and information technology.