UCLA College | Physical Sciences
Chemistry & Biochemistry

Chem 218: Student Exit Seminar

"Van der Waals Integration beyond 2D Heterostructures"

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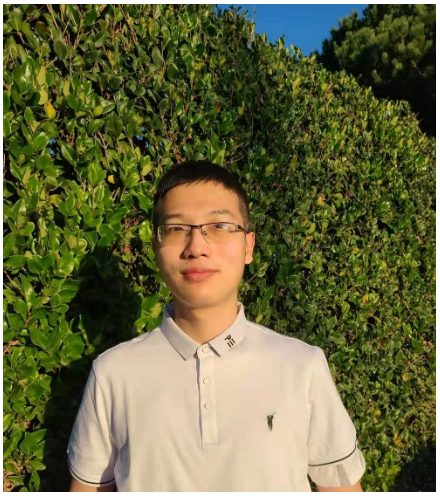
Abstract: The integration of dissimilar materials to form heterostructures with designable electronic interfaces is central in modern electronic devices and has thus been a long pursuit in material science. The traditional integration methods such as metal evaporation, atomic layer deposition (ALD) and epitaxial growth typically rely on strong chemical bonds to combine the constituent materials. However, this approach has limited freedom in integrating materials with distinct structural or chemical compositions due to the lattice matching or process compatibility requirements. Inspired by the variety of 2D van der Waals (vdW) heterostructures, a physical transfer process exploiting the universal vdW force is proposed for damage-free integration of metal contact and 2D semiconductors to form pinning-free junctions approaching Schottky-Mott limit, opening up vast freedom for creating a new generation of vdW-integrated devices beyond the reach of traditional heterostructures. This talk summarizes our recent progress of vdW integration of high-quality contacts of nearly arbitrary metals, gate dielectrics and bulk semiconductors to create high-performance devices including 2D metal-oxide-semiconductor field-effect transistors (MOSFETs), metal-semiconductor FETs (MESFETs) and junction FETs (JFETs) based on bulk semiconductor β-Ga_2O_3, which all exhibit atomically clean and electronically sharp interfaces with nearly ideal electronic functions. These devices extend vdW integration to a broader library of materials for creating high-performance electronic devices and explore the potential of vdW integration as a general and efficient approach for circuit-level integration.



Thursday, April 29th, 2021
12:00 p.m.
Via Zoom

For questions, please contact: jzabala@chem.ucla.edu