

2024 IBS-CALDES Seminar

✓ **Date & Time:** 4:00PM, October 31 (Thu), 2024

✓ **Venue:** IBS POSTECH Campus Bldg. 105

✓ **Speaker & Title**

4:00PM~ Prof. Jungdae KIM (University of Ulsan)

Exploring two-dimensional materials via scanning tunneling
microscopy

** This talk will be given only in Korean.*

Organized by: Dr. Jhinhwan LEE (jhinhwan@ibs.re.kr, 054-260-9014)

■ **4:00PM~**

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Exploring two-dimensional materials via scanning tunneling microscopy

Jungdae KIM

Dept. of Semiconductor Engineering & Physics, University of Ulsan

This talk presents a comprehensive investigation into the anisotropic electronic properties of Ni-based van der Waals materials, specifically NiTe₂ and its alloy NiTeSe, along with the discovery of a novel two-dimensional crystal of oxygen, "oxylene," on a Cu(111) substrate. We employ a combination of scanning tunneling microscopy (STM), angle-resolved photoemission spectroscopy (ARPES), and density functional theory (DFT) to explore the anisotropic behavior in NiTeSe and NiTe₂. The substitution of Te with Se in NiTe₂ induces pronounced in-plane anisotropy, which is evident in the charge distribution and directional variations in carrier velocities. In parallel, we report the formation of oxylene, a highly ordered 2D honeycomb structure composed of oxygen atoms on Cu(111), stabilized by the exceptional oxidation resistance of the substrate. STM studies reveal the periodic arrangement of oxygen atoms at fcc and hcp sites of Cu(111) surface with a 4×4 periodicity on the Cu(111) surface. Furthermore, spin-sensitive STM measurements reveal oxylene's unique magnetic ordering. DFT calculations corroborate the observed structural model and identify the magnetic octupole moments of the oxygen atoms, resulting in net magnetic moments of ~0.4 μ_B at hcp sites and less than 0.1 μ_B at fcc sites.