



Department of Materials Science and Engineering Seminar Series 2026

STRUCTURE-INDUCED POLARIZATION IN TWO-DIMENSIONAL VAN DER WAALS INTERFACES

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Date and time: 04th November 2026 4:00pm

Venue: EA-06-04

Abstract

Interfacial polarization in two-dimensional van der Waals materials is closely coupled to stacking registry and non-uniform deformation. Establishing a spatially resolved connection between these structural degrees of freedom and the resulting polar response remains a central experimental challenge.

In this work, we combine controlled structural manipulation with scanning-probe microscopy to investigate rhombohedral MoS₂ and bilayer hexagonal boron nitride (hBN). In 3R-MoS₂, we resolve cumulative surface-potential steps and demonstrate complementary mechanical and electrical control of stacking-related polar states through directional shear and local domain writing. Folded interfaces exhibit electrostatic changes consistent with partial polarization compensation, while a representative folded device displays a bipolar-like gate response. In bilayer hBN, bubbles and suspended membranes exhibit edge-localized electrostatic contrast correlated with curvature and strain gradients, supporting a flexoelectricity-associated interpretation.

These findings establish a spatially resolved framework connecting structural manipulation with interfacial electrostatics and electromechanical response, highlighting stacking and deformation as complementary routes to engineering nanoscale polar functionality without altering material composition.

Biography

Tingyu Wang is currently a Ph.D. candidate in the Department of Materials Science and Engineering at the National University of Singapore, under the supervision of Prof. Konstantin Novoselov and Prof. Colin Robert Woods. PhD Thesis_Wang Tingyu Her research focuses on scanning-probe microscopy, sliding ferroelectricity and electromechanical coupling in two-dimensional materials.

Please join us!

HOST: Assistant Prof Zhu Di