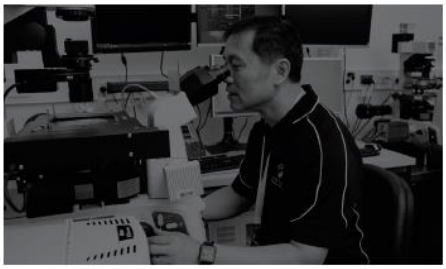

Ferroelectricity in Two-Dimensional Heterobilayers

Professor Shu Ping Lau
Department of Applied Physics,
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2:00pm, 27/02/2024
Melbourne Centre for Nanofabrication
151 Wellington Road, Clayton, 3168
Zoom link: click here
Meeting ID: 880 2472 4631 and passcode: 865805

Ferroelectricity in Two-Dimensional Heterobilayers

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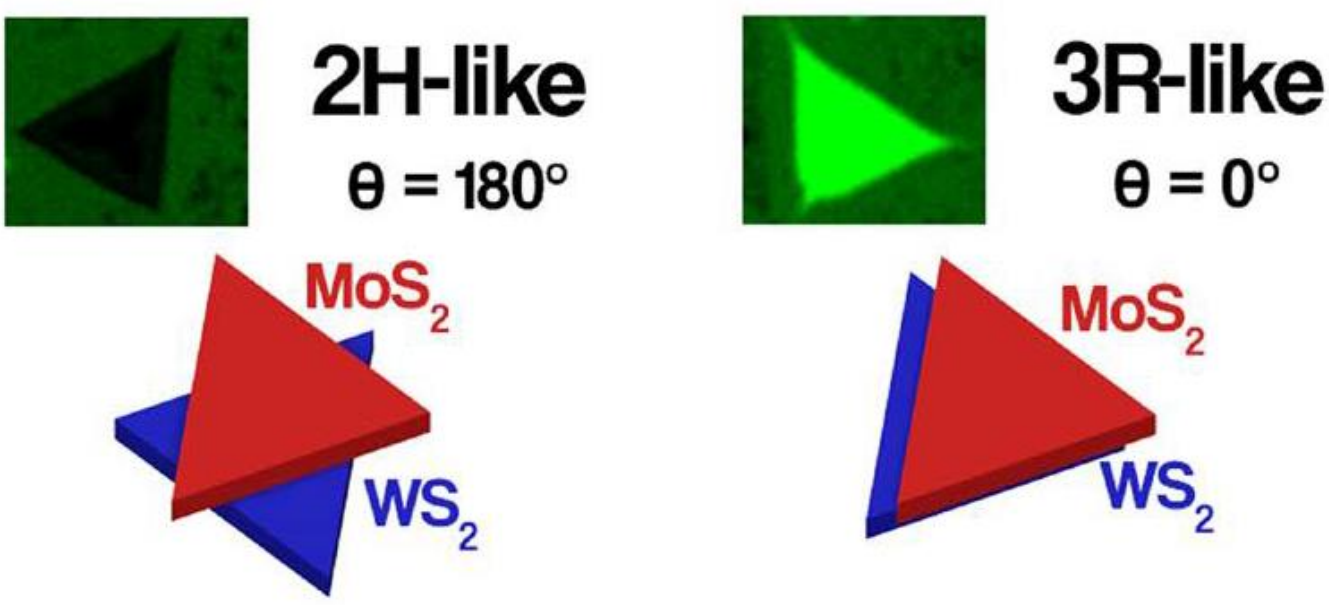
Abstract:
Two-dimensional (2D) materials with out-of-plane (OOP) ferroelectric and piezoelectric properties are highly desirable to realize ultrathin ferro- and piezo-electronic devices. We demonstrate unexpected OOP ferroelectricity and piezoelectricity in untwisted, commensurate, and epitaxial MoS_2/WS_2 heterobilayers synthesized by scalable one-step chemical vapour deposition (CVD). The modulation of tunneling current by ~10^3 times in ferroelectric tunnel junction (FTJ) devices by changing the polarization state of MoS_2/WS_2 heterobilayers was demonstrated. Our results are consistent with density functional theory, which shows that symmetry breaking and interlayer sliding give rise to unexpected properties without invoking twist angles or Moiré domains [1].
Ref: [1] Lukas Rogée *et al.*, Science 376, 973–978 (2022)



Relationship between second harmonic generation intensity and vertical stacking angleθ. Dark triangles are labelled 2H-like and bright triangles 3R-like.

Professor Shu Ping Lau is a Chair Professor and Head of the Department of Applied Physics at the Hong Kong Polytechnic University. He is also the Director of the University Research Facility in Materials Characterization and Device Fabrication and Associate Director of the Photonic Research Institute. Prof Lau is a Fellow of the American Physical Society. He is the Highly Cited Researcher by Clarivate (2023). He has published over 400 journal papers with over 26500 citations and has an H-index of 83. Prof. Lau's current research focuses on nanomaterials and energy materials, particularly the synthesis of 2D materials for ferroelectricity, electrocatalysis, and energy storage applications.