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應用物理及材料工程研究院
INSTITUTO DE FÍSICA APLICADA E ENGENHARIA DE MATERIAIS
INSTITUTE OF APPLIED PHYSICS AND MATERIALS ENGINEERING

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IAPME Seminar

Celebrating the 45th Anniversary of the University of Macau: Interlayer Quantum Coupling in van der Waals Materials: From Moiré Physics to Emergent Quantum States

21 May 2026

Prof. Wei JI
Renmin University of China

Venue: N23-3022
Time: 10:00 - 11:00
Hosted by: Prof. Yongqing CAI

Abstract

Interlayer coupling in layered 2D materials is not merely a weak perturbation, but an active quantum degree of freedom capable of fundamentally reconstructing electronic, magnetic, and excitonic properties. In the talk, I will introduce the emergent interlayer phenomena in two-dimensional van der Waals quantum materials, particularly moiré systems, layered magnets, and correlated electronic states. We reveal how stacking order, twist angle, strain, and interlayer hybridization can induce magnetic phase transitions, tune magnetic easy axes, and generate novel moiré quantum states in atomically thin materials. In layered magnetic materials such as CrSBr, CrI_3, and $MnSe_2$, the intralayer strain and stacking-dependent interlayer interactions can strongly modify magnetic coupling through changes in electron localization and interlayer hopping. These works established new microscopic mechanisms for controlling two-dimensional magnetism via structural engineering.

Biography

Prof. Wei JI is a Wu Yuzhang Chair Professor in the Department of Physics at Renmin University of China. He has also been selected as a young top - notch talent in the National Special Support Program (2014), a young teaching master in Beijing (2022), and a Tianfu Scholar in Sichuan Province (2023). He has long been committed to developing and applying unique first-principles calculation methods, focusing on the surface and interface problems of functional materials and devices. He has published more than 200 papers in journals including Science, Science Advances, Nature Materials, Nature Nanotechnology, Nature Chemistry, Nature Communications, PRL, and JACS, with the number of citations exceeding 14,000 (WoS data). Currently, he serves as a member of the Computational Materials Science Committee of the Chinese Materials Research Society and an editorial board member of Science Bulletin, Chinese Physics B, Acta Physica Sinica, 2D Materials, and Frontiers of Physics.