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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

IAPME Seminar

Celebrating the 40th Anniversary of the University of Macau:

Atomic study of defects and its correlations to the material properties in novel 2D materials

Prof. Junhao LIN

Southern University of Science and Technology

Date: 03/12/2021; Time: 10:30 - 11:30; Venue: N23-4018

Two-dimensional (2D) materials are considered to be the candidates for future nano-electronic applications. It is well known that defects are determinant to the properties of materials, thus understanding defects in 2D materials serves as the key step for functionality engineering and improved performance in devices. In this talk, I will first show the atomic scale characterizations of defect structures in various emerging 2D materials by low-voltage STEM with home-built atmosphere control system, including monolayer amorphous carbon, air-sensitive $NbSe_2$ monolayer and 1T' phase Te-based alloy monolayer, and elaborate how they affect the physical properties of the materials. Then I will demonstrate the atom-by-atom structural evolutions in 2D materials as monitored by sequential low voltage Z-contrast STEM imaging and the related underlying physics. Examples include Se vacancy-induced inversion domain nucleation in $MoSe_2$, the origin of novel 2D Pd_2Se_3 phase driven by interlayer fusion in layered $PdSe_2$, and the in situ observation of electron beam induced synthesis of hexagonal $MoSe_2$ from square FeSe. At the end of the talk, I will discuss the in-situ fabrication of highly stable metallic nanowires with MX stoichiometry within the transition-metal dichalcogenide (TMD) monolayers by steering the electron beam with atomic precision.

Introduction of speaker

Prof. Junhao Lin obtained his PhD degree of Physics from Vanderbilt University, USA in 2015. He was trained in both theoretical density functional theory (DFT) and experimental scanning transmission electron microscopy (STEM), in which he combines these two techniques synergistically to investigate the structure-property correlations in Dtwo-dimensional (2D) materials. He had his postdoctoral work as a JSPS fellow in AIST, Japan from 2015-2018, hosted by r. Kazu Suenaga, and continue the research mostly in 2D materials with low-voltage monochromatic S/TEM. He is now an associate professor in the Physics Department, Southern University of Science and Technology (SuSTech). His main research direction including analysis of complex defect structures in novel layered materials, real time *in-situ* observation of the dynamical processes in structural transition of materials under various environmental stimulations, and the development of stable 2D ferromagnetic and ferroelectric materials. He has published more than 80 journal papers, including first/corresponding authored paper in Nature, Nature Nanotechnology, Nature Materials, PRL and etc, with a total citation of more than 7700 times, H-index 34.

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