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INSTITUTO DE FÍSICA APLICADA E ENGENHARIA DE MATERIAIS
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LAPME Seminar

The optical and optoelectronic properties of excitonic states in 2D transition metal dichalcogenide (TMDC) and heterostructures

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Date: 28/11/2023; Time: 14:00 - 15:00; Venue: N23-4018

In this talk, I will first present the investigation of the polarization behaviors of the triplet trions and singlet trions in ML-WS₂ under cw linear-polarized light excitation in out-of-plane magnetic fields. We observed that the magnetic-field dependence of the polarization degree of the singlet trions is negative at nondegenerate electron-density regime and becomes positive at weakly degenerate electron-density regime, while that of the triplet trions remains positive. A model is proposed to quantitatively analyze the polarization behaviors of the triplet and singlet trions based the valley polarizations of the electrons and excitons. This work reveals that the helicity of the trion emissions under linear-polarized light excitation can be tuned more effectively at lower electron-density. Then, I will show that a significant photocurrent enhancement in hybrid vertical junction devices made of strained few-layer graphene and InGaN quantum dots. Optoelectronic response and photoluminescence measurements demonstrate a possible mechanism closely tied to the flexoelectric effect in few-layer graphene, where the strain can induce a lateral built-in electric field and assist the separation of electron-hole pairs. Photocurrent mapping reveals an unprecedentedly ordered hexagonal network, suggesting the potential to create a superlattice by strain engineering.



Prof. Wang obtained her B.S. Degree at Xi'an Jiaotong University, and M.Sc. Degree in Chinese Academy of Science, and PhD degree at University of Bristol. Prof. Wang did her postdoc research at University of Bristol and University of Nottingham. In 1994, Prof. Wang joined Hong Kong University of Science & Technology (HKUST), and now is a Chair Professor. From 2013-2017, Prof. Wang was the Director of HKUST's William Mong Institute of Nano Science and Technology. Currently, Prof. Wang is Head of the Department of Physics, and is awarded Wu Chien-Shiung Professorship of HKUST and Fellow of Physical Society of Hong Kong.

Prof. Wang's current research interests include magneto transport and optical studies of quantum materials including topological materials, 2D materials, and van der Waals heterostructures, and wide gap semiconductor heterostructures. Professor Wang's work on quantum materials, semiconductor heterostructures, and spintronics is paving the way for next-generation devices that meet the needs of modern society across markets.

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