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IAPME Seminar

Giant Optical Nonlinearity of Interlayer Excitons in WSe_2/MoS_2 Moiré Superlattices

3 December 2024

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Venue: N23-4018
Time: 14:00 - 15:00
Hosted by: Prof. Shen LAI

Abstract

Semiconductor moiré superlattices, created by stacking monolayer transition metal dichalcogenides, provide an ideal platform for exploring abundant correlated insulating states, the anomalous quantum Hall effect, and giant optical responses. These properties enable them promising for various applications, such as quantum simulator and ultrasmall on-chip laser.

In this talk, I will discuss our recent work on study of optical nonlinearity of interlayer excitons in WSe_2/MoS_2 Moiré superlattices. Through energy- and time-resolved photoluminescence measurements, we observed quantum cascade transition between interlayer excitons. We achieved interlayer exciton population inversion at higher-energy moiré levels. Furthermore, we demonstrated that the coherence of moiré interlayer excitons can be enhanced through boson excitonic correlation and effects of Fermions correlated insulating states. Our findings highlight the potential applications of semiconductors moiré materials in exciton quantum cascade lasers, quantum information protocols.

Biography

Prof. Qinghai TAN is a professor in School of Microelectronics at University of Science and Technology of China. Prof. Tan received his PhD from Institute of Semiconductor, Chinese Academy of Science in 2018. After that, he worked as a research fellow in Weibo Gao's group at Nanyang Technological University, Singapore from 2019-2023 and then a senior Scientist at A*STAR, Singapore. Currently, his research focuses on the novel quantum states in 2D semiconductor moiré systems and advanced optoelectronic devices based on two dimensional semiconductors and semiconductor moiré materials.