北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Weekly Seminar

Atomically Thin Materials and Heterostructures: Wafer-scale Synthesis, Properties and Applications

郝建华

The Hong Kong Polytechnic University

Time: 4:00pm, Dec. 14, 2015 (Wednesday)

时间：2016年12月14日 （周三）下午4:00

Venue: Room w563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

Abstract

The ultimate goal of making nanoscale electronic and optoelectronic devices greatly stimulates atomically thin material and heterostructure research. We have deposited wafer-scale a-black phosphorus (BP) ultrathin films and two-dimensional (2D) layered materials by pulsed laser deposition. Transport and optical properties of the atomically thin materials are studied. Additionally, layer-dependent nonlinear optical properties and stability of non-centrosymmetric modification are observed in few-layer GaSe. Furthermore, we have introduced rare-earth Er dopants into 2D MoS2 and realize near-infrared (NIR)-to-NIR down- and up-conversion photoluminescence. In our study, the electronic and optical properties of graphene and 2D semiconductors can be tuned by the ferroelectric polarization and piezoelectricity. We have developed a novel graphene field-effect transistor (GFET) based on vertical tunneling heterostructures with the complementary structures possessing the features of both ferroelectricity and conventional GFET. Consequently, atomically thin materials and heterostructures can provide platforms to address fundamental issues and develop novel device applications.

About the speaker

Jianhua Hao is a Full Professor and Associate Head of Department of Applied Physics in the Hong Kong Polytechnic University (PolyU). He received his BSc, MSc and PhD at Huazhong University of Science and Technology, China. After working at Penn State University, USA, University of Guelph, Canada and the University of Hong Kong, Jianhua Hao joined the faculty in PolyU in 2006. Jianhua Hao has published more than 200 SCI papers. He has been listed as one of Most Cited Scientists in Materials Science. He is also the first inventor of several US patents. In Hong Kong, Jianhua Hao has been PI in 14 external competitive grants from main funding sources for research (9 RGC GRF, 3 ITF and 2 NSFC), and Co-PI in 1 RGC CRF. He serves as Editorial Board Member/Senior Editor for several international journals, such as Scientific Reports（NPG）and Advanced Optical Materials (Wiley). He is now Vice-President of Physical Society of Hong Kong (2015-2017). He has been General Chair/Session Chair/Organizing Committee Member for various international conferences. He was also invited to give a number of Keynote/Invited Lectures in various international conferences. Jianhua Hao's research interests include (1) Luminescence and phosphors for photonic, energy and biomedical applications; (2) Functional thin-films, two-dimensional layered materials and heterostructures (Hao research group website: http://ap.polyu.edu.hk/apjhhao/).