



Weekly Seminar

Flatland: the landscape of 2D materials

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Time: 4:00pm, Dec. 20, 2017 (Wednesday)

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Venue: Room W563, Physics building, Peking University

地点: 北京大学物理楼, 西563会议室



Abstract

The one-atom-thick crystal like graphene have fantastic properties and attracted tremendous interests in these years, which open a window to the landscape of the two-dimensional (2D) materials. There are a large variety of 2D materials beyond graphene that are to be explored. Using chemical solid reaction and chemical vapour deposition, we have successfully synthesized a wide spectrum of 2D materials including both single crystal bulk and atomically thin films. In this talk, I will briefly introduce development of 2D materials over the past ten years and our recent work in this area, including the advances in the synthesis of various 2D materials, engineering of 2D materials and fabrication of 2D alloy. I will also discuss the unique physical properties of such as 2D superconductivity (MoTe_2 and NbSe_2), 2D ferroelectricity (CuInP_2S_4), 2D ferromagnetism and 2D Wyle semi-metals. In the last, I will introduce the potential applications of 2D materials for novel electronics, composite, energy and catalysis.

About the speaker

Dr. Zheng Liu received his B.S. degrees (2005) at Nankai University (China), and completed his PhD at National Centre for Nanoscience and Technology (NCNST, China), working on the synthesis and energy harvest of carbon nanotubes. He then worked in Prof Pulickel M. Ajayan and Prof Jun Lou's groups as a joint postdoc research fellow (2010~2012) and research scientist (2012~2013) at Rice University (USA).

His research focus on following topics: 1) Synthesis of high-quality and large-size novel 2D monolayers, especially, a full spectrum of transition metal dichalcogenides (TMDs), the biggest family ever known in 2D materials. 2) Engineering of 2D materials such as lateral/vertical 2D heterostructure and alloy; 3) Physical properties of 2D monolayers such as 2D superconductivity (MoTe_2 and NbSe_2), 2D ferroelectricity (CuInP_2S_4), 2D ferromagnetism and 2D Wyle semi-metals ($\text{W}_x\text{Mo}_{1-x}\text{Te}_2$ and TaIrTe_4). 3) Applications of 2D materials such as novel electronics (Semi-floating gate FET, Inorganic/organic PN junction and rectifier, Ferroelectrically non-volatile memory); Detector and sensors (Atom-thin photodetector, photoconductive switch and Microelectromechanical sensor); Coating and composite (high-temperature oxidation-resistant coating, binder-free fire-resistant wood coatings), energy and catalysis (Li-ion battery, supercapacitor, ORR, HER, etc).

He has published more than 140 peer-reviewed papers in top journals including 16 papers in Nature and Science serial journals (**Nature Materials**, **Nature Nanotechnology**, **Nature Communications** and **Science Advances**); 22 in **Nano Letters**; 18 in **Advanced Materials**; 9 in **ACS Nano**, with **total citations more than 12000 and h-index of 48**. These works have also been reported by many renowned media such as **Science daily**, **Phy.org**, **EEE spectrum**, etc., and also highlighted by the top journals such as **Nature Physics**, **Nature Nanotechnology**, **Chem Int Ed**, etc. He was also a recipient of the **World Technology Award in Energy category** in 2012, the prestigious Singapore NRF Fellowship, and the elite Nanyang Assistant Professorship in 2013.