



Seminar

Novel Interaction and Topological Effects in the Electronic and Optical Properties of Two-Dimensional Materials

Ting Cao

Department of Physics, University of California, Berkeley



Time: 2:30pm, June 13, 2018(Wednesday)

时间: 2018年6月13日 (周三) 下午2:30

Venue: Room W563, Physics building, Peking University

地点: 北京大学物理楼, 西563会议室

Abstract

Recent advances in the experimental and theoretical studies of atomically thin two-dimensional (2D) materials have opened up opportunities in exploring new phenomena and properties as well as related applications absent in conventional bulk materials. In the first part of my talk, I will present our theoretical studies on the quantum excited-state phenomena in monolayer transition metal dichalcogenides and gapped few-layer graphene. By theoretical analyses and *ab initio* GW-BSE calculations, we discover excitons with exceptional binding energies due to the reduced dielectric screening in 2D (thus dominating their optical spectrum) and unusual optical selection rules resulting from a nontrivial topological band effect which occurs only in 2D. In the second part, I will discuss our discovery of topological phases in graphene nanoribbons. The topological phases enable us to rationally design a prototype graphene nanoribbon superlattice that hosts a coupled array of non-trivial junction states. I further connect our theoretical predictions to experimental results and demonstrate their potential applications.

About the speaker

Ting Cao is from the University of California, Berkeley, expecting to receive his Ph.D. degree in the summer of 2018. His dissertation research focus on excited-state phenomena and light-matter interactions in two-dimensional materials, under the guidance of Professor Steven G. Louie. His current research employs quantum physics, advanced materials modelling techniques, and high-performance computing to explore the distinct physical properties of one- and two-dimensional material systems which are potentially useful for future applications. He was awarded a GLAM postdoctoral fellowship at Stanford University for 2018-2020.