北京大学量子材料科学中心
International Center for Quantum Materials, PKU

Electronic Transport and Device Applications of 2D Materials

Fengnian Xia

Yale University

Abstract

Two-dimensional materials exhibit diverse electronic properties, ranging from metallic graphene and semiconducting transition metal dichalcogenides such as molybdenum disulphide, to insulating hexagonal boron nitride [1]. In this talk, I will first address the physics of light-graphene interaction within the single-electron framework, followed by a discussion of light excitation of collective oscillations of the carriers, i.e., plasmons in graphene. I will focus on the unique graphene plasmonic properties arising from its “massless” carriers [2-3]. Then I will briefly cover the advantages and disadvantages of semiconducting transition metal dichalcogenides in optoelectronics and electronics if compared with graphene. Finally I will discuss a few promising future research directions using recently rediscovered black phosphorus [4-6], which serendipitously bridges the zero-gap graphene and the relatively large-bandgap transition metal dichalcogenides such as molybdenum disulfide (MoS_2).

1. F. Xia, H. Wang, D. Xiao, M. Dubey, and A.