MAR17-2016-020395

Abstract for an Invited Paper
for the MAR17 Meeting of
the American Physical Society

Valley and spin dependent physics in two-dimensional materials

KIN FAI MAK, Penn State University

Electrons in two-dimensional (2D) van der Waals' materials with a honeycomb lattice structure possess both the valley pseudospin and the spin degree of freedom (DOF). The valley DOF is associated with the degenerate conduction/valence band extrema at the K and the K' point of the Brillouin zone. When inversion symmetry is broken, interesting valley and spin dependent phenomena, such as spin-valley locking and the valley Hall effect (VHE), emerge. These unique properties are not only fundamentally important, but may also find applications in valley/spin based electronics and optoelectronics. In this talk, I will discuss our recent experiments on probing the valley and spin dependent properties in 2D transition metal dichalcogenides (TMDs). In particular, I will present results on the observation and the control of the VHE in TMD semiconductors. I will also discuss the influence of robust spin-valley locking on the physical properties of hole-doped TMD metals.