NES15-2015-000070

Abstract for an Invited Paper
for the NES15 Meeting of
the American Physical Society

Two-dimensional materials represent the next frontier in advanced materials for electronic applications. Their extreme thinness (3 or less atoms thick) give them great flexibility, optical transparency and an unsurpassed surface-to-volume ratio. At the sa

TONY HEINZ, Columbia University

Graphene, a single atomic layer of carbon atoms, has attracted great attention worldwide because of its potential for novel science and technology. Recently, this interest has expanded to the much wider class of 2D materials that occur as layers of van-der-Waals crystals. While preserving graphene's flexibility and tunability by external perturbations, atomically thin layers of this broader set of materials provides access to more varied electronic and optical properties, including semiconducting and insulating behavior. In this presentation, we will discuss some of the distinctive optical properties of this emerging class of atomically thin 2D materials. Graphene has now been investigated across a spectral range from the THz to the UV. The optical properties reveal much interesting physics and also show strong tunability in response by means of external gating. Recently, atomically thin layers of semiconductors in the family of transition metal dichalcogenides (MX2 where M = Mo, W and X = S, Se, Te) have also been prepared and investigated. Although weak light emitters in the bulk, at monolayer thickness these materials emit light efficiently. We will describe some of the surprising properties of these systems, from strong and anomalous excitonic effects to valley selective excitation and control.