Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Internal Webinar

A study on the electronic and structural properties of semiconductor heterostructures

Joydeep Chatterjee

University of Calcutta, Kolkata

Electronic structures of 2D layered materials and van der Waal's heterostructures found huge interest due to their exotic properties and usefulness in technology. We have done few studies on these materials. We examined the type-I to type-II electronic structure transition occurring in classical GaAs/AlAs heterostructure as a function of the thickness of the GaAs layers. We investigated the anomalous electronic properties of ReS_2, which is a member of the family of transition metal dichalcogenides. We have probed why ReS_2 is found to be semiconducting despite having an odd number of electrons in the outermost d-shell of Re ion and also the origin of weak interlayer interaction in ReS_2. We also probed the electronic structure changes in group-IVB TMDs as a function of changing the anion. We find that, in these materials, it is the scaling of the hopping interaction strengths with M-X bond lengths that is responsible for transition of the electronic ground state from semiconductor to metal in going from MSe_2 to MTe_2, where M is the transition metal ion.

Thursday, Apr 28th 2022

03:30 PM