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Poster: *Synthesis, Doping, and Properties of 2D Materials*

Since the successful isolation of graphene, two-dimensional materials have rapidly moved to the forefront of "next generation" materials. The many applications range from enhancing the structural properties of composite material properties, to water filtration, biosensing, catalysis, photonics, and ultra-low power electronics. However, none of these applications will be possible without a concerted effort to develop techniques to understand how the 2D layers are synthesized and doped. Transition metal dichalcogenides (TMDs) MeX2 (where Me = a transition metal such as Mo, W, Ti, Nb, etc. and X = S, Se, or Te) exhibit extreme flexibility, possession of tunable band gaps, modest electron mobilities, and wide variety of band-offsets. Synthesizing and heterogeneously combining these atomic layered TMDs to form van der Waals (vdW) solids, where each layer may be different from the previous, is a powerful way to develop novel nanoscale materials. Furthermore, having the ability to tune the physics and chemistry through doping is the foundation for "properties-on-demand", which can have an enormous impact on current and future technologies. In this talk, I will discuss recent developments in our group related to controllable synthesis of TMDs, as well as the integration of 2D materials to form van der Waals solids. Finally, I will discuss the importance of understanding the substrate when attempting to dope 2D materials.