Doping and Heterostructure of TMD Materials

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For atomically thin transition metal dichalcogenides (TMDs) semiconductors, substitutional doping of TM impurities during the growth of chemical vapor deposition (CVD) is global, not complying with the design rules for their applications in electronics. Search of a doping methodology that can be selective and controllable over the carrier type, location, and doping level is the most pressing barrier for the development of advanced electronics based on such atomic semiconductors. Here, we report a CVD doping technique for single-layer TMDs, which allows site-selective substitution of lattice metals by foreign TM impurities while retaining the structural integrity. Another part of the talk will be focus on the heterostructure of TMD materials. I will show the formation of WS_2/WSe_2 hetero-nanostructures with coherence interfaces. A periodic potential landscape can be tailored in the lateral WS_2/WSe_2 heterostructures making use of the type-II band alignment. A rich variety of new applications are explored using the conventional device architecture combined with the TMD heterostructure.

Keywords – Transition metal dichalcogenides, Doping, Heterostructure.

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