Ultra-Thin Crystals from Theory to Applications

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Following the succesfull synthesis of one-atom-thick graphene sheets in 2004, studies have revealed presence of many novel ultra-thin crystal structures. Among these especially Transition Metal Dichalcogenides (TMDs) such as MoS2, WS2 and WSe2 with their stable atomic structure and energy bandgaps covering the visible light spectrum are promising materials for optoelectronic device applications. In addition, synthesis of another class of ultra-thin materials, post-TMDs such as GaS, GaSe, InS and InSe has been achieved recently. Post-TMDs, with their strain-tunable electronic band structures and stable atomic structure, are quite promissing materials for sensor and coating applications. Another hot topic of the material research is perovskites. Although perovskites provide a playground for highly efficient solar cells, there are still ongoing studies on their environmental stability problem.