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Controlled Synthesis of Hexagonal Boron Nitride on Cu Foil Using Chemical Vapor Deposition

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Recently, atomically smooth hexagonal boron nitride(h-BN) known as a white graphene has drawn great attention since the discovery of graphene. h-BN is a III-V compound and has a honeycomb structure very similar to graphene with smaller lattice mismatch. Because of strong covalent sp2bonds like graphene, h-BN provides a high thermal conductivity and mechanical strength as well as chemical stability of h-BN superior to graphene. While graphene has a high electrical conductivity, h-BN has a highly dielectric property as an insulator with optical band gap up to 6eV. Similar to the graphene, h-BN can be applied to a variety of field, such as gate dielectric layers/substrate, ultraviolet emitter, transparent membrane, and protective coatings. However, up until recently, obtaining and controlling good quality monolayer h-BN layers have been too difficult and challenging. In this work, we investigate the controlled synthesis of h-BN layers according to the growth condition, time, temperature, and gas partial pressure. h-BN is obtained by using chemical vapor deposition on Cu foil with ammonia borane (BH_3NH_3) as a source for h-BN. Scanning Transmission Electron Microscopy (STEM, JEOL-JEM-ARM200F) is used for imaging and structural analysis of h-BN layer. Sample's surface morphology is characterized by Field emission scanning electron microscopy (SEM, JEOL JSM-7100F). h-BN is analyzed by Raman spectroscopy (HORIBA, ARAMIS) and its topographic variations by Atomic force microscopy (AFM, Park Systems XE-100).

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