Multi-layered Heterostructures Based on Pure 2D Materials for Optoelectronic Devices

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Two-dimensional (2D) materials hold great potential for fundamental research as well as prospects for technological breakthroughs in many different applications. Since the observation of unusual physical properties of graphene triggered an explosion of research in 2004, a wide variety of other 2D materials like transition metal dichalcogenides (TMDs) have also received increasing attention, particularly in the last couple of years. The isolation of various ultrathin 2D materials, and the possibility to vertically or laterally stack them, has created a new page in materials science: 2D heterostructures. The van der Waals heterostructures based on TMDs and other 2D materials, such as graphene and hexagonal boron nitride (h-BN), where graphene is an ideal candidate for electrodes and h-BN is a promising dielectric material, are believed to be the fundamental platform for a wide range of future electronic and optoelectronic applications in the area of ultrathin, flexible, and transparent devices, such as field-effect transistors, solar cells, Light emitting diodes and lasers. In this work, we realized the synthesis of 2D materials by chemical vapour deposition (CVD) under atmospheric pressure. These materials were then combined *via* layer by layer transfer to fabricate 2D heterostructures for red channel light emittors.