Wafer-scale Synthesis of WSe_2/MoS_2 van der Waals heterostructures

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Abstract

The transition metal dichalcogenides (TMDs) such as WSe_2 and MoS_2 represent a class of two-dimensional materials with unique properties. The van der Waals hetero-structures of the TMDs are potentials for novel electronic and photonic device in the future. However, the practical semiconductor fabrication is performed in a wafer-scale size, where the machines easily product a great amount of chips by batch fabrication. Thus, the reported synthesis for TMDs heterostructures based on the chemical vapor deposition (CVD) has only reached the small-size area level of few centimeter.[1-3] Here, we report that a direct CVD growth technique provides wafer-scale type II heterostructural stacking film "WSe_2 on MoS_2" (WSe_2/MoS_2). In Figure 1 it was shows that the photography and Raman spectroscopy of WSe_2/MoS_2. In Figure 2, atomic force microscope shows that the height of the vertical stacked structure of WSe_2 and MoS_2 for 1.47 nm.

References

[1] Yongji Gong, et al, Nano Letter, Issue9 ,(2015) page6135-6141
[2] Ming-Yang Li, et al, Science, Issue6247 (2015) page524-528
[3] Yongji Gong, et al, Nature Materials, Issue13 (2014) page1135-1142

Figures

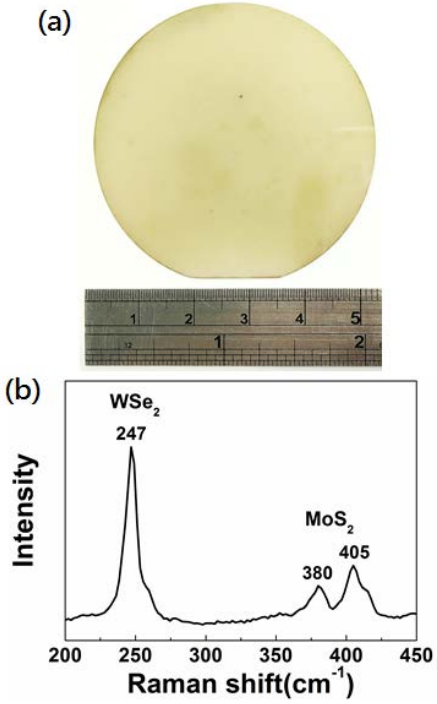

Figure 1: Photography and Raman spectrum of vertical heterstructures of WSe_2 and MoS_2.

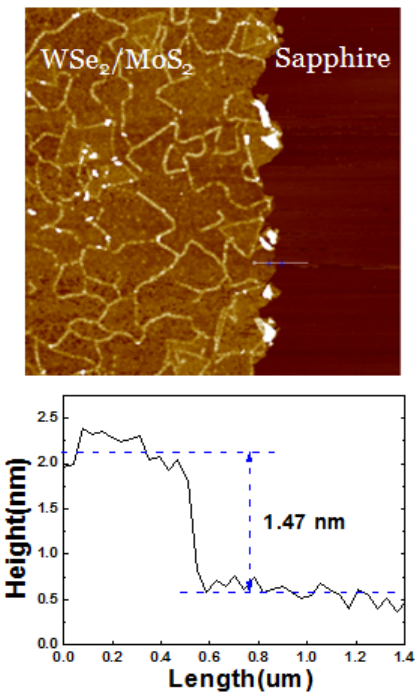

Figure 2: AFM images and the thickness of vertical heterstructures of WSe_2 and MoS_2.