

Chemical Vapor Deposition Growth of InSe Heterostructures

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Abstract

The group-III monochalcogenides such as indium selenide (InSe) represent a class of two-dimensional materials with unique properties. The van der Waals heterostructures of the InSe and hexagonal boron nitride (hBN) are potentials for novel electronic device in the future. However, most of the InSe/h-BN devices have been based on mechanical exfoliation [1,2], which results in random lateral size and uncontrollable thickness of samples. In our previous work [3], the chemical vapor deposition (CVD) synthesis of high-quality, large-area InSe monolayers has been reported. Here, we report that a direct CVD growth technique provides type II heterostructural stacking film "InSe on hBN" (InSe/hBN). In Figure 1 it was shows that the optical microscope (OM) and atomic force microscope (AFM) images of hBN before and after CVD InSe growth. In Figure 2, cross-section TEM image of a monolayer InSe film upon few-layer hBN showing the atomic arrangement. Meanwhile, the synthesized InSe films can be grown to hBN substrates, prompting research efforts to probe its characteristics and applications of stacked heterostructures.

References

- [1] Denis A. Bandurin et al., Nature Nanotechnology, 12 (2016) 223-227.
- [2] Yu-Ting Huang et al., ACS Appl. Mater. Interfaces, 10 (2018) 33450-33456.
- [3] Han-Ching Chang et al., Small, 14 (2018) 1802351.

Figures

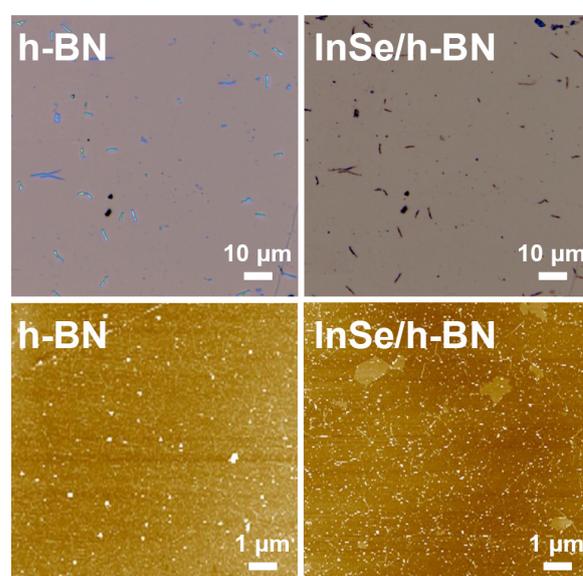


Figure 1: OM and AFM images of hBN before and after CVD InSe growth.

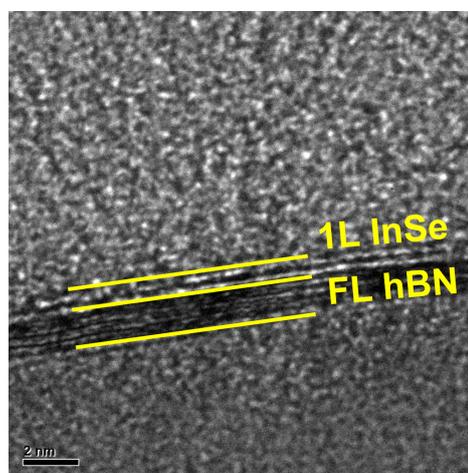


Figure 2: Cross-section TEM image of the InSe/hBN heterostructure film.