Controlled Synthesis of Wafer-Scale High-Quality ε-InSe by Pulsed Laser Deposition for Potential Piezo-Photonic Applications

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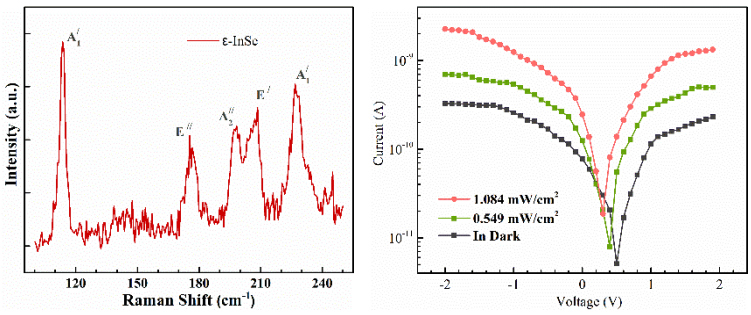
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I. Abstract

Scalable synthesis is now a significant issue for few-layer two-dimensional (2D) materials on investigating their unique properties and developing their value towards practical applications. However, wafer-scale synthesis of single-crystalline 2D InSe in few-layer (below 10) state has not yet been realized, highly hindering further investigation and development on related electronic applications. Here, we demonstrate a direct-synthesis strategy for scalable ε-InSe ultrathin films through pulsed laser deposition (PLD). A selenium-excessive target was used to realize designable stoichiometric growth by in-situ precise control, so as to avoid the risk of potential phase transition that may occur in the conventional post-selenium-annealing. As-synthesized ε-InSe films can be demonstrated through X-Ray Diffraction (XRD) and Transmission Electron Microscope (TEM) measurement, while their crystal phase was further evidenced by Raman study. Additionally, photodetectors were fabricated on as-synthesized ε-InSe films, and considerable photo-response can be resulted under white-light illumination. This reliable approach for synthesizing wafer-scale few-layer ε-InSe paves the way towards future photo-electronic applications in the 2D limit. This research is supported by the grant Research Grants Council of Hong Kong (GRF No. PolyU 153023/18P) and National Natural Science Foundation of China (NSFC No.51972279).

II. Image:



III. Reference:

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IV. Biography:

Zehan WU is now a Ph.D. candidate at the Hong Kong Polytechnic University (PolyU) under the supervision of Prof. Jianhua Hao. His research interests include scalable synthesis and electrical demonstration of 2D layered materials.

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