Controlling Orientation of VLS-grown Lead Iodide van der Waals Nanowires

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Lead iodide (PbI_2) with van der Waals (vdW) layered crystal structure is widely used as a precursor to prepare lead halide perovskites (LHPs) for diverse applications such as photovoltaics (PVs) or optoelectronics. Fabrication of low-dimensional structures would be beneficial for the enhancement of their physical properties, light absorption and carrier lifetime, compared to its bulk counterpart. Furthermore, the ability to engineer the structure of 1D nanowires broadens the field of applications.

Here, we demonstrate that the orientation of PbI_2 vdW nanowires grown by vapor-liquid-solid (VLS) method can be controlled *via* $PbBr_2$ introduction. We can control two different types of kinking modes: (1) [20-21] orientation with twin boundary (TB), (2) [-12-10] orientation. Our kinked PbI_2 nanowires having different vdW stacking in a single domain exhibit interesting optical property such as localized photoluminescence, suggesting their potential use in photonics or optoelectronics.