$PbI_2/MoSe_2$ van der Waals heterostructures: Engineering heterointerface and optoelectronics

허이구, 황윤정, 강성구[1], 신내철†
인하대학교; [1]울산대학교
(nshin@inha.ac.kr†)

Two-dimensional (2D) semiconducting materials have attracted significant attention due to their exotic electronic and optoelectronic properties dependent on the structures. Furthermore, 2D semiconductors comprising vertically stacked heterostructure show substantial potential for bandgap engineering by controlling the van der Waals interactions of the given layer configurations, which is impossible in conventional 3D crystalline semiconductors. Herein, we demonstrate the heterostructures composed of 2D $MoSe_2$ and PbI_2, with distinct interface configurations. First, nanostructures composed of PbI_2 multilayers were prepared by VLS growth, which showed two different stacking orientations(i.e., [0001] and [-12-10]). They were transferred onto the CVD grown $MoSe_2$ monolayers, resulting in the distinct heterointerface. We confirmed that PL is dependent on the interface configurations between $MoSe_2$ and PbI_2. An ab initio calculation further supported that the band alignments are contingent upon the atomic arrangement at the heterointerface. Our results contribute to the development of the bandgap-engineered vdW heterostructures.