Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Epitaxial growth of two-dimensional $SnSe_2/MoS_2$ misfit heterostructures

Mei Zhao, Manman Liu, Youqing Dong, Chao Zou, Keqin Yang, Yun Yang, Lijie Zhang * and Shaoming Huang *

College of Chemistry and Materials Engineering, Wenzhou University, ~~Zhejiang Key Laboratory of Carbon Materials,~~ Wenzhou 325035, China

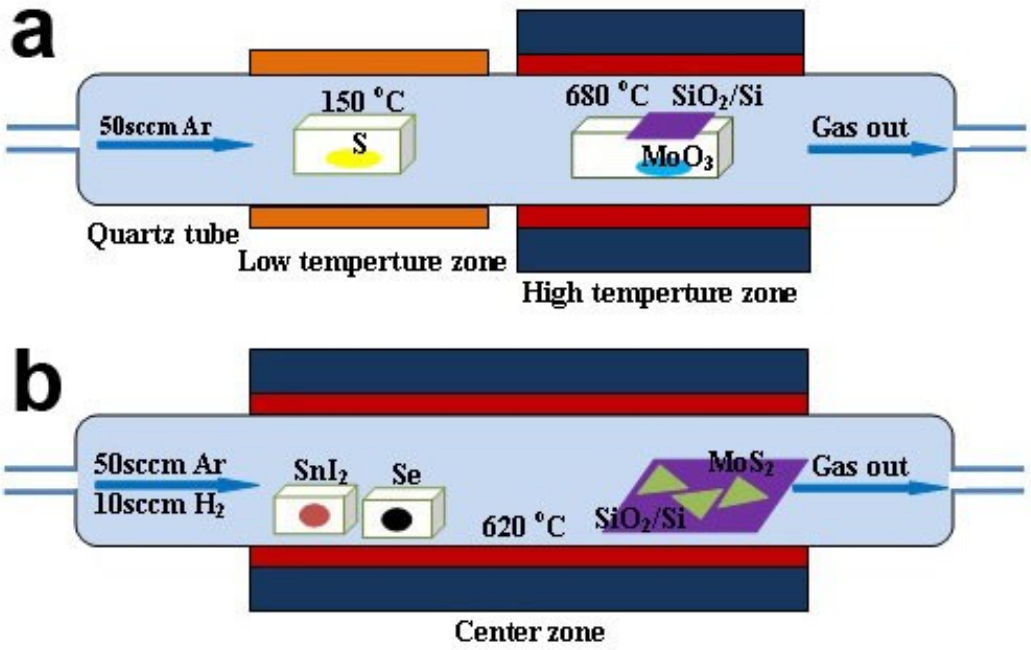

Figure S1 Schematic illustration of the CVD system for the growth of (a) Monolayer MoS_2 triangular sheets and (b) $SnSe_2/MoS_2$ heterostrutures.

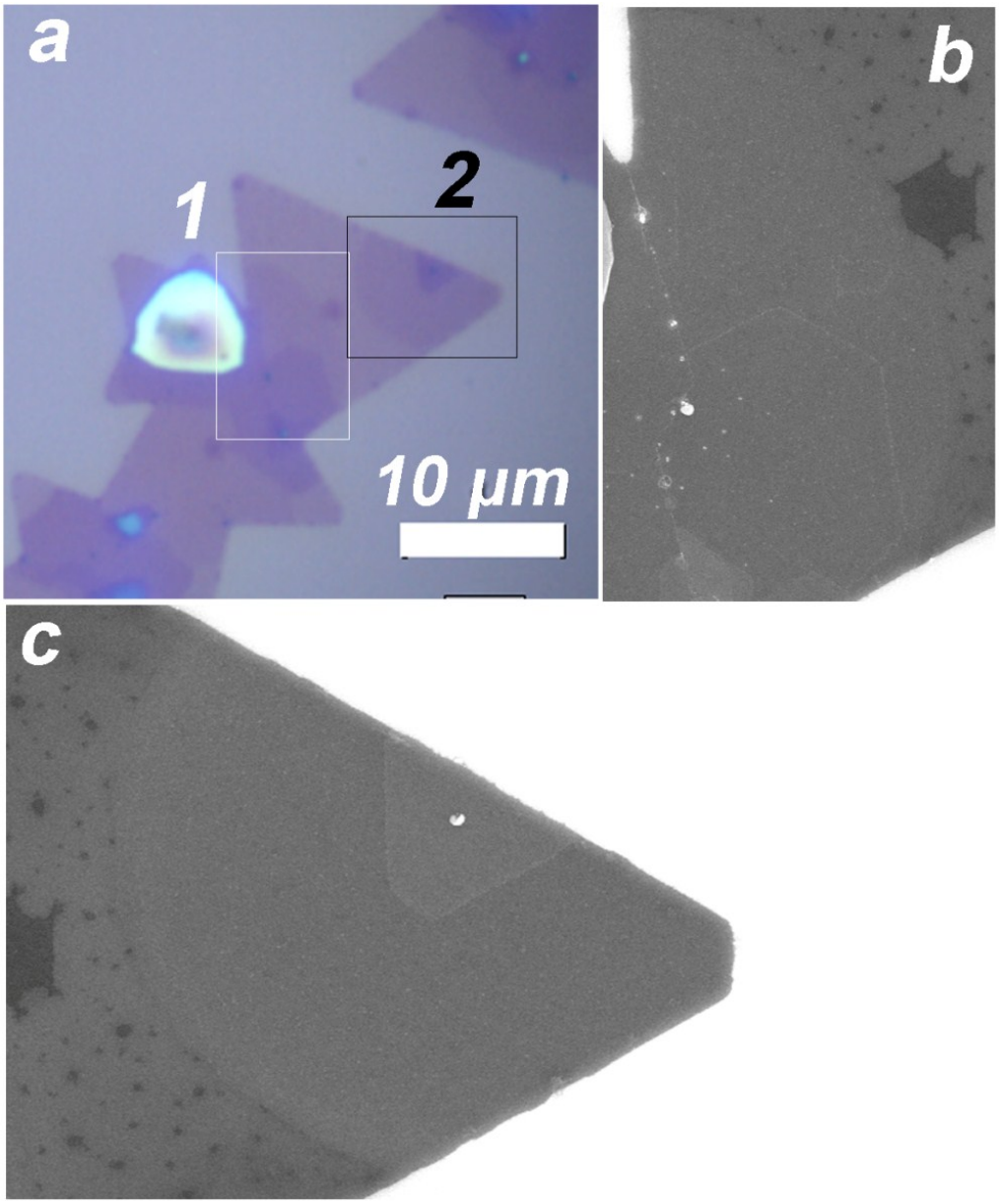

Figure S2 (a) Optical microscope image of the $SnSe_2/MoS_2$ heterojunctions. (b, c) Enlarged view of SEM images (SEI mode) of the area indicated by white rectangle and black rectangle, respectively. We can see the layer-by-layer stacking structures in the SEM images (SEI mode).

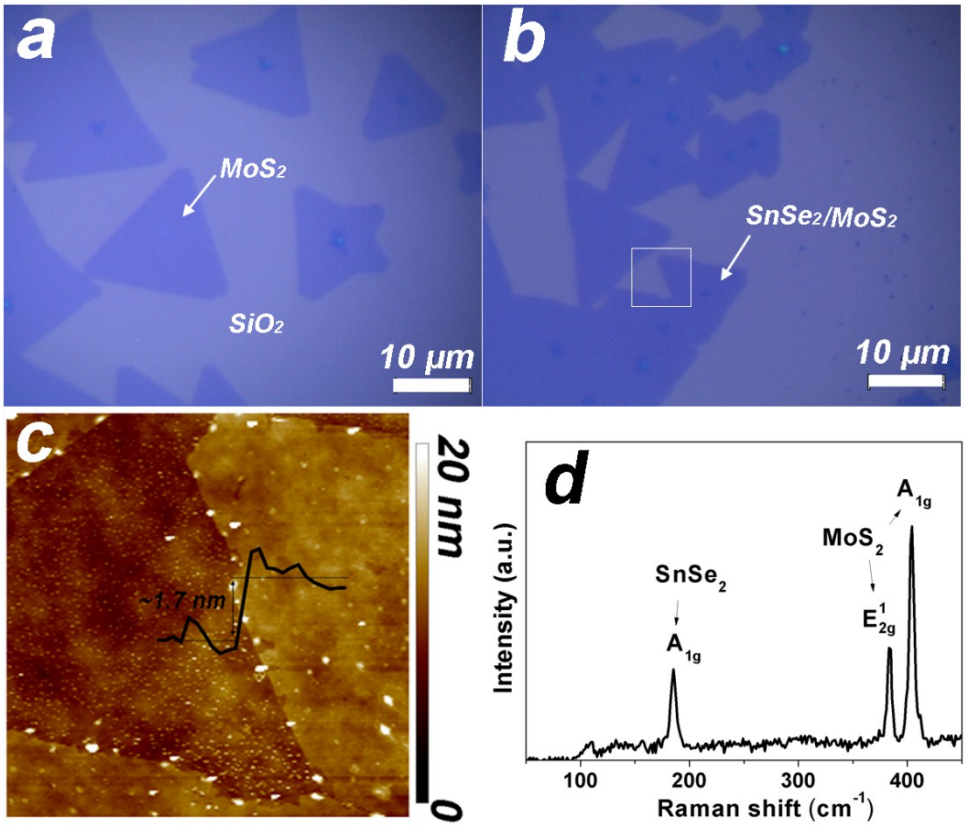

Figure S3 (a) Optical microscope image of monolayer MoS_2 on SiO_2/Si. (b) Optical microscope image of $SnSe_2$/MoS_2 bilayers on the substrate. The $SnSe_2$ monolayers were grown on MoS_2 via the van der Waals epitaxial growth process. (c) Atomic force microscope image of the region indicated by rectangle in (b), confirming monolayer $SnSe_2$ on monolayer MoS_2. (d) A typical raman spectroscopy of the $SnSe_2$/MoS_2 heterojunctions.

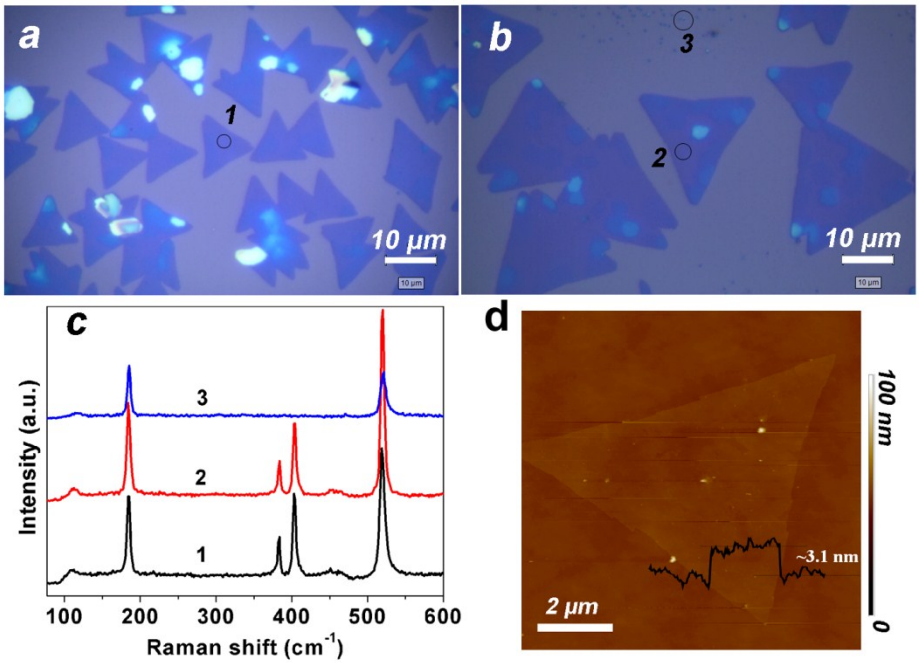

Figure S4 Optical microscope images of the $SnSe_2/MoS_2$ heterojunctions obtained at the relative high- (a) and low- (b) temperature zone. (c) Raman spectra collected from the different positions in (a) and (b). The ratio of peak intensity between A_{1g} of $SnSe_2$ and E^1_{2g} of MoS_2 indicates multilayer of the as-grown $SnSe_2$. The particles on SiO_2 in (b) is identified to be $SnSe_2$ by the Raman spectroscopy. (d) AFM image of a multilayer-$SnSe_2$/monolayer-MoS_2 heterojunction. The height profile shows thickness of 3.1 nm.

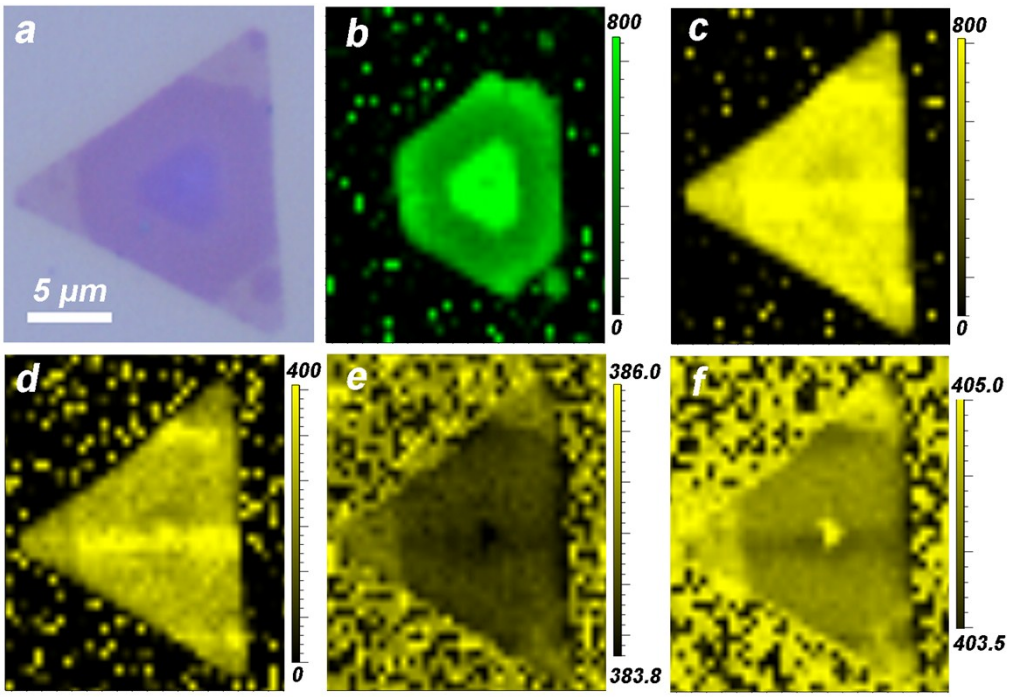

Figure S5 (a) An optical microscope image of a triangular MoS_2 monolayer covered partially with a $SnSe_2$ multilayer. Spatially resolved Raman maps for the intensity of A_{1g} of $SnSe_2$ (b), A_{1g} of MoS_2 (c), E^1_{2g} of MoS_2 (d), and the peak position of E^1_{2g} of MoS_2 (e), A_{1g} of MoS_2 (f).

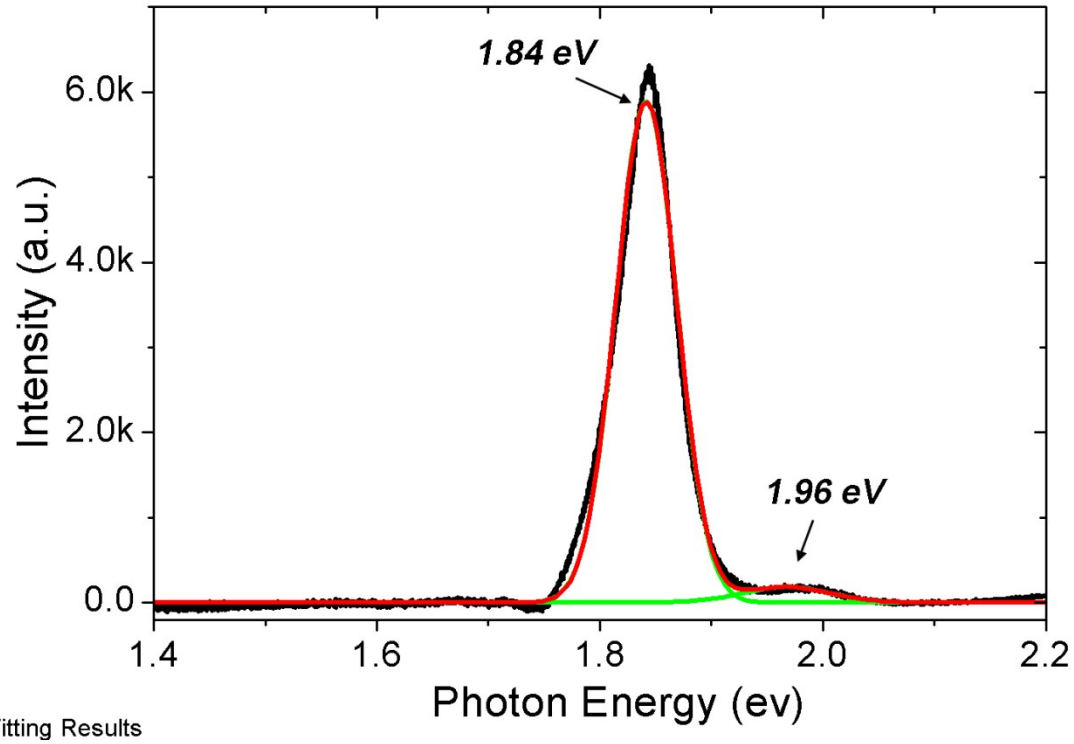

Figure S6 The photoluminescence spectrum collected from bare MoS_2 monolayer and its fitted curves. The emission bands at 1.84 and 1.96 eV correspond to A and B exciton recombination, respectively.