Supporting Information

In-plane Mosaic Potential Growth of Large−Area 2D Layered Semiconductors MoS_2-$MoSe_2$ Lateral Heterostructures and Photodetector Application

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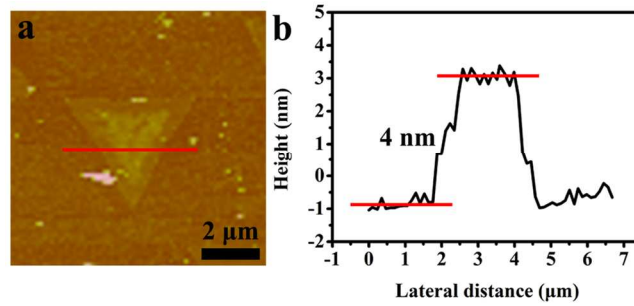
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Figure S1. (a) AFM image and (b) the corresponding height profile of the mosaic $MoS_2/MoSe_2$ lateral heterojunctions film with the thick MoS_2 at the centre.
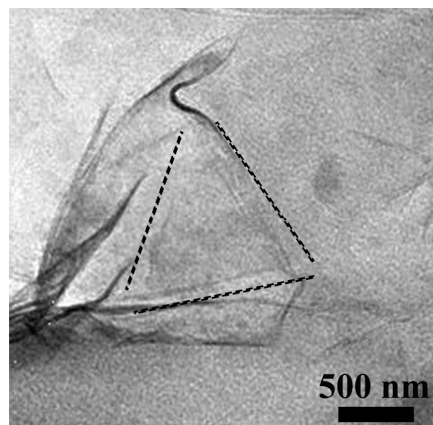
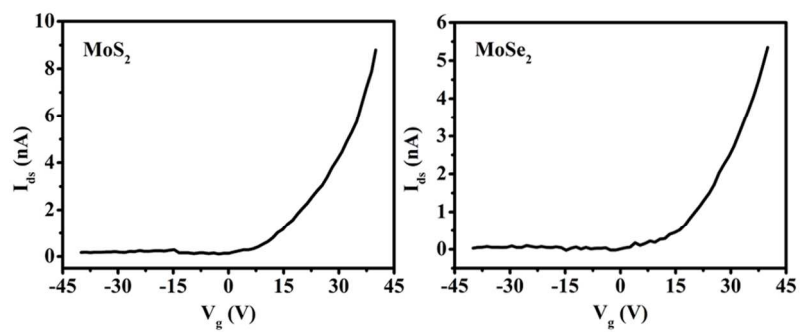**Figure S2.** TEM image of mosaic $MoS_2/MoSe_2$ lateral heterojunctions film.

Figure S3. Transfer characteristics of the synthetic MoS_2 and $MoSe_2$ at $V_{ds} = 1$ V.
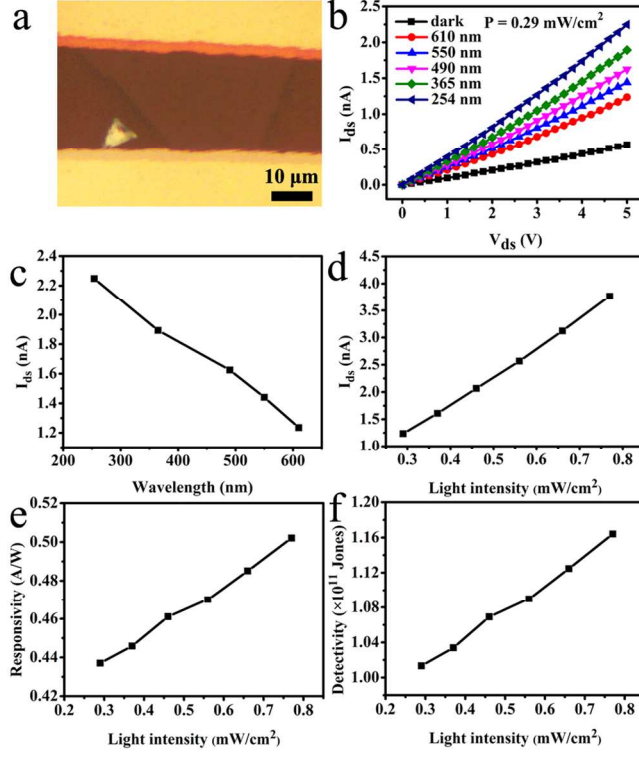
Figure S4. Triangular MoS_2 monolayer photodetector. (a) Optical image of the photodetector device. (b) I_{ds}-V_{ds} characteristic of the photodetector in dark and under various light wavelength with light intensity of 0.29 mW/cm^2. (c) Photocurrent as a function of light wavelength at V_{ds} = 5 V with light intensity of 0.29 mW/cm^2. (d) Photocurrent as a function of light intensity with light wavelength of 610 nm at V_{ds} = 5 V. Responsivity (e) and detectivity (f) of the photodetector with different light intensity, light wavelength of 610 nm at V_{ds} = 5 V.
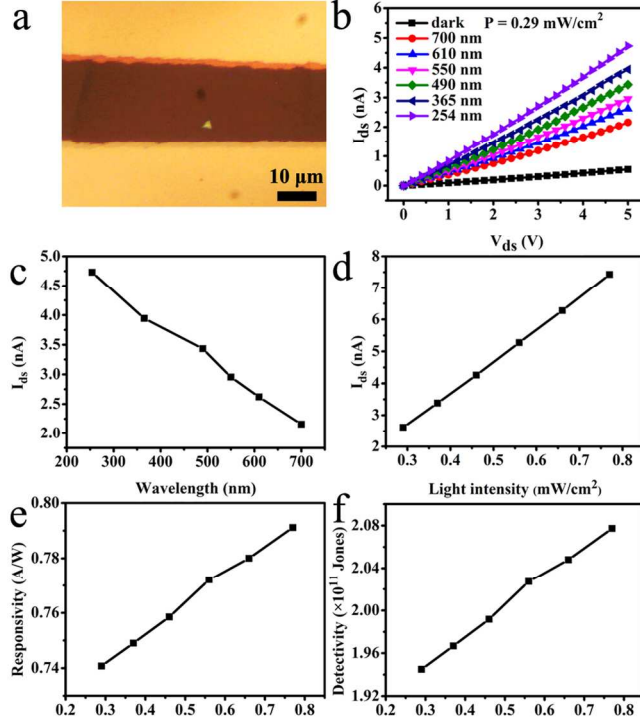
Figure S5. Multilayer $MoSe_2$ film photodetector. (a) Optical image of the photodetector device. (b) I_{ds}-V_{ds} characteristic of the photodetector in dark and under various light wavelength with light intensity of 0.29 mW/cm^2. (c) Photocurrent as a function of light wavelength at V_{ds} = 5 V with light intensity of 0.29 mW/cm^2. (d) Photocurrent as a function of light intensity with light wavelength of 610 nm at V_{ds} = 5 V. Responsivity (e) and detectivity (f) of the photodetector with different light intensity, light wavelength of 610 nm at V_{ds} = 5 V.
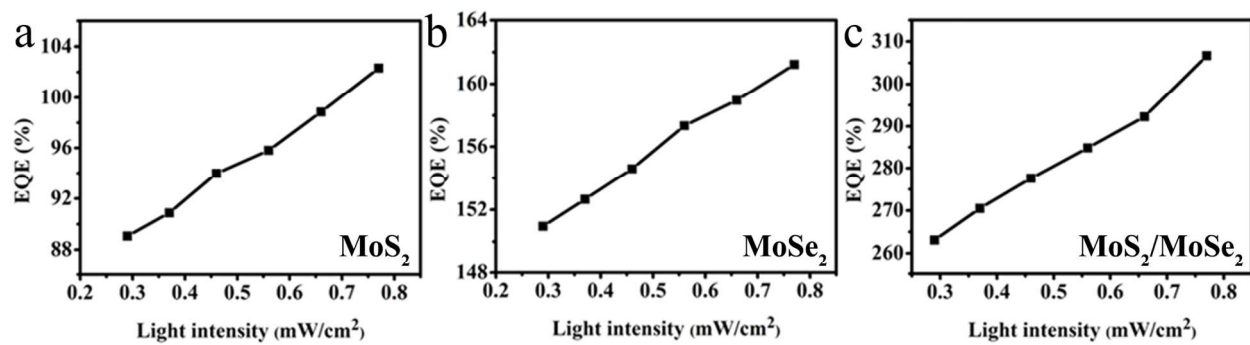
Figure S6. EQE of triangular MoS$_2$ monolayer (a), multilayer MoSe$_2$ film (b) and mosaic MoS$_2$/MoSe$_2$ lateral heterojunctions film (c) photodetector with different light intensity, light wavelength of 610 nm at V$_{ds}$ = 5 V.