Supporting Information

Tunable WSe₂-CdS Mixed-dimensional van der Waals Heterojunction with Piezo-phototronic effect for Enhanced Flexible Photodetector

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Fig. S1. SEM images of as-grown CdS nanowires. Inset: EDS spectrum for the synthetic material, indicating that Cd and S are the major elements. The atomic percentage of S is less than that of Cd, which implies the presence of sulfide vacancies and $n$-type property of CdS.

Fig. S2. Raman (a) and PL (b) spectra of WSe$_2$ nanosheet stimulated with 532 nm laser. The data in (b) reveal two peaks, which indicate the indirect ($\sim$900 nm) and direct ($\sim$780 nm) interband transitions.
Fig. S3. (a) $J$-$V$ characteristics of the WSe$_2$-CdS diode under dark and different 680 nm optical illumination intensities. (b) Short-circuit current $J_{sc}$, open-circuit voltage $V_{oc}$ as a function of optical power with the data extracted from (a). (c) Temporal response of the photocurrent generation under 11.74 mW cm$^{-2}$ illumination at 0 V bias. (d) Schematic band diagram of WSe$_2$-CdS and the photovoltaic effect.

Fig. S4. The calculated change in drain current $I_{ds}$ and p-n junction barrier height as a function of strain in dark at +2 V drain bias.
Fig. S5. (a) Photodetection performance change of the device at different heights when illuminating 5.3 mW cm\(^{-2}\) (calibrated when \(\Delta h=0\)) laser. The device was moved up or down for different height change (\(\Delta h\)) while keeping the substrate flat, as shown in the inset. (b) Calculated \(I_{ds}\) as a function of height change at +2 V drain bias.

Fig. S6. (a) Time-dependent photoresponse of device to 7.89 mW cm\(^{-2}\) optical illumination under different strains at +2 V drain bias. (b) The corresponding rise and recover time for the device under different strains.
Fig. S7. Fabrication process of 2D WSe$_2$ nanosheet-1D CdS nanobelt heterostructure on PET substrate, the scale bar is 10 μm.