Supporting Information

Catalyst-free growth of layer-structured $CuInSe_2$/β-In_2Se_3 microwires for ultrasensitive self-powered photodetectors based on lateral p-n junction

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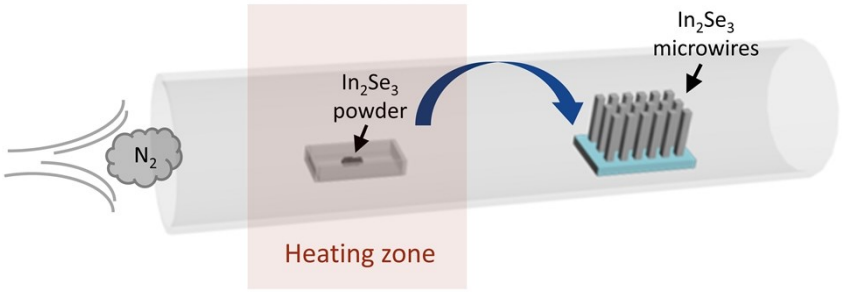

Fig. S1 Schematic diagram of layer-structured In_2Se_3 microwires prepared by chemical vapor deposition (CVD) method.

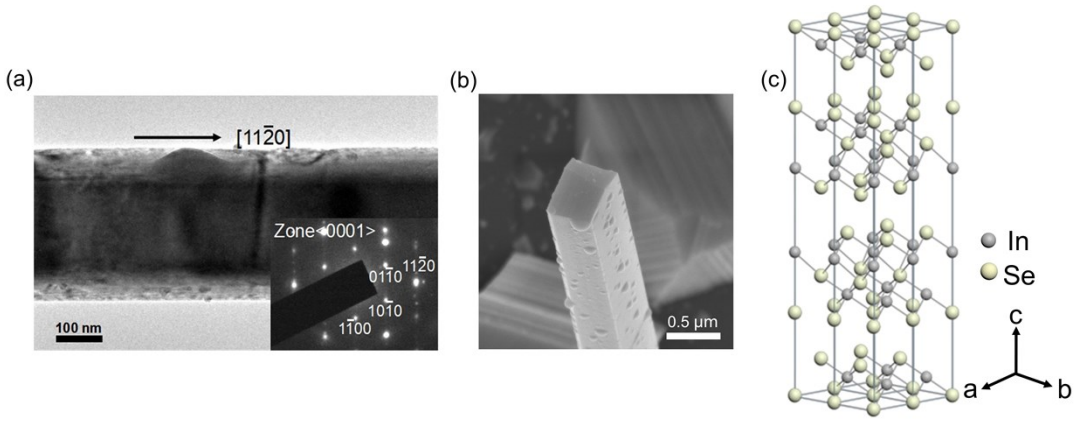

Fig. S2 (a) Low-magnification TEM image of a single-crystalline hexagonal In_2Se_3 microwire with the $[11\bar{2}0]$ growth direction. Inset: corresponding SEAD pattern. (b) The cross-section view of In_2Se_3 microwire. (c) Layered crystal structure of β-In_2Se_3 based on the octahedral bonding of the Se-In-Se-In-Se layers.

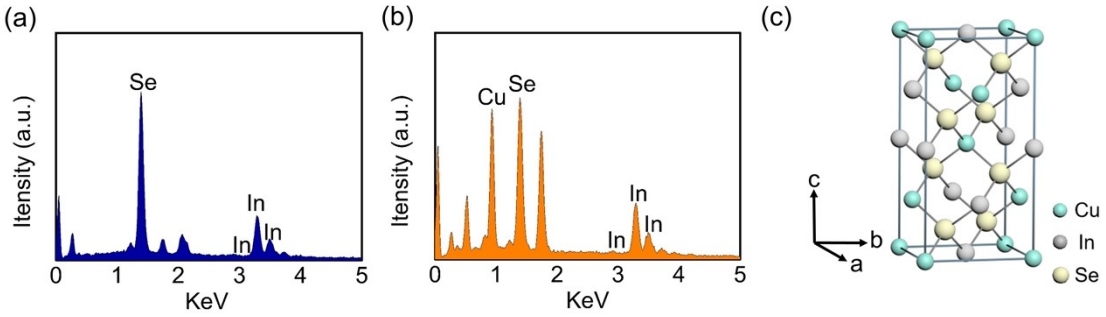

Fig. S3 (a) EDS spectrum of the as-prepared In_2Se_3 microwires. (b) EDS spectrum of the as-prepared $CuInSe_2$ microwires. (c) The crystal structure of $CuInSe_2$.

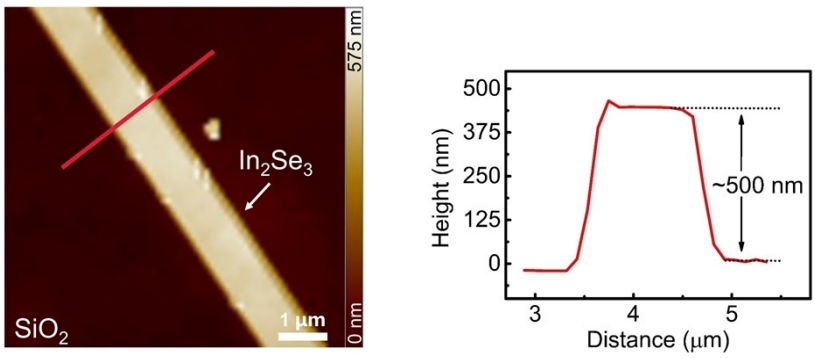

Fig. S4 The AFM image of In_2Se_3 microwire in the 1D layer-structured $CuInSe_2/In_2Se_3$ lateral p-n junction.

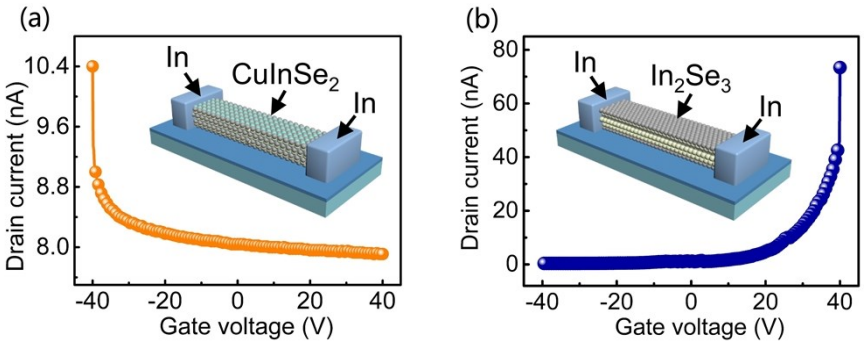

Fig. S5 (a) Transfer curve of $CuInSe_2$ field-effect transistor. Inset: schematic diagram of $CuInSe_2$ field-effect transistor. (b) Transfer curve of In_2Se_3 field-effect transistor. Inset: schematic diagram of In_2Se_3 field-effect transistor.

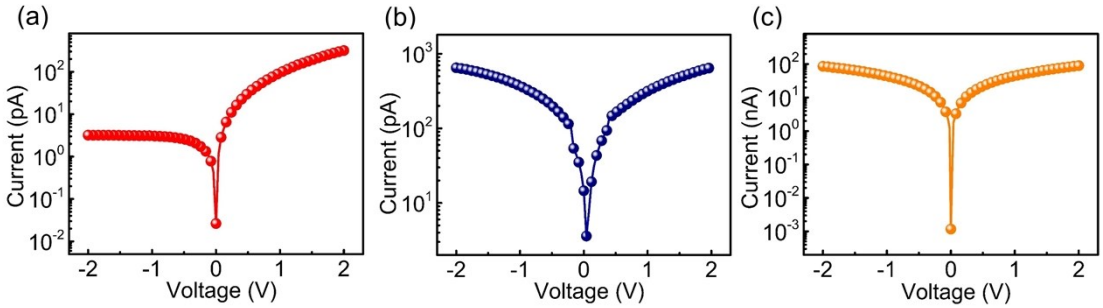

Fig. S6 (a) I-V curve of $In/CuInSe_2/In_2Se_3/In$ device in logarithmic coordination. (b) I-V curve of $In/In_2Se_3/In$ device in logarithmic coordination. (c) I-V curve of $In/CuInSe_2/In$ device in logarithmic coordination.

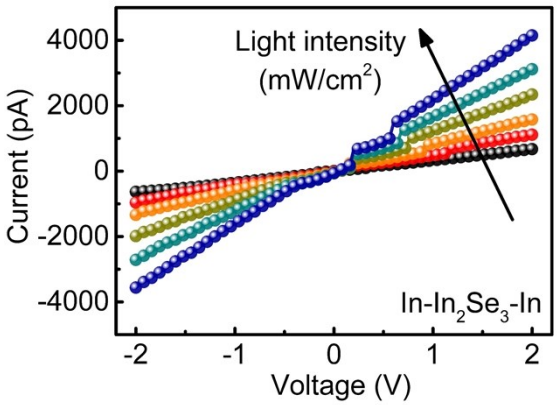

Fig. S7 I-V curves of In_2Se_3 device under different light intensities (405 nm; 0.19, 1.7, 4.1, 11.2, 25.2 mW/cm^2).

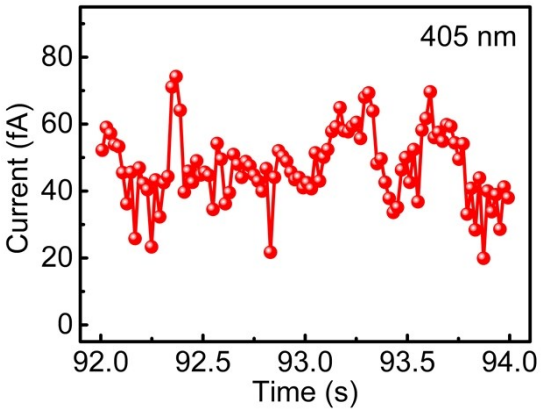

Fig. S8 An amplificatory dark current of 1D lateral $CuInSe_2/In_2Se_3$ p-n junction photodetector in Fig. 6a.

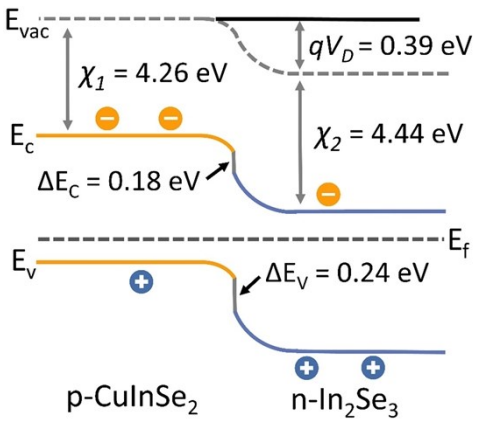

Fig. S9 Energy band diagram of the 1D layer-structured $CuInSe_2/In_2Se_3$ lateral p-n junction under dark.