Supporting Information

2D/1D PbI_2/Sb_2S_3 van der Waals Heterojunction for Highly Sensitive and Broadband Photodetectors

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[⊥] Shili Fu and Xiaohui Liu contributed equally to this work.

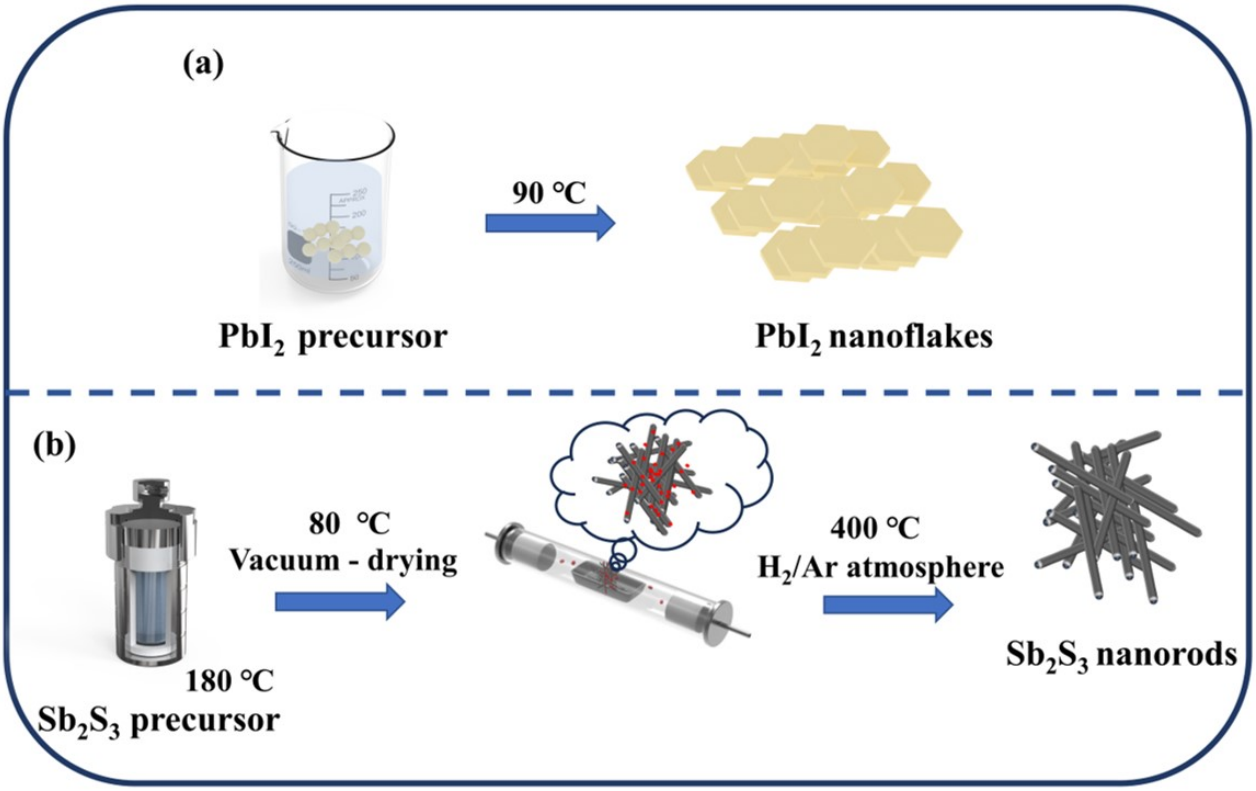


Figure S1. Schematic synthesis routes of (a) PbI_2 nanosheets and (b) Sb_2S_3 microrods, respectively.

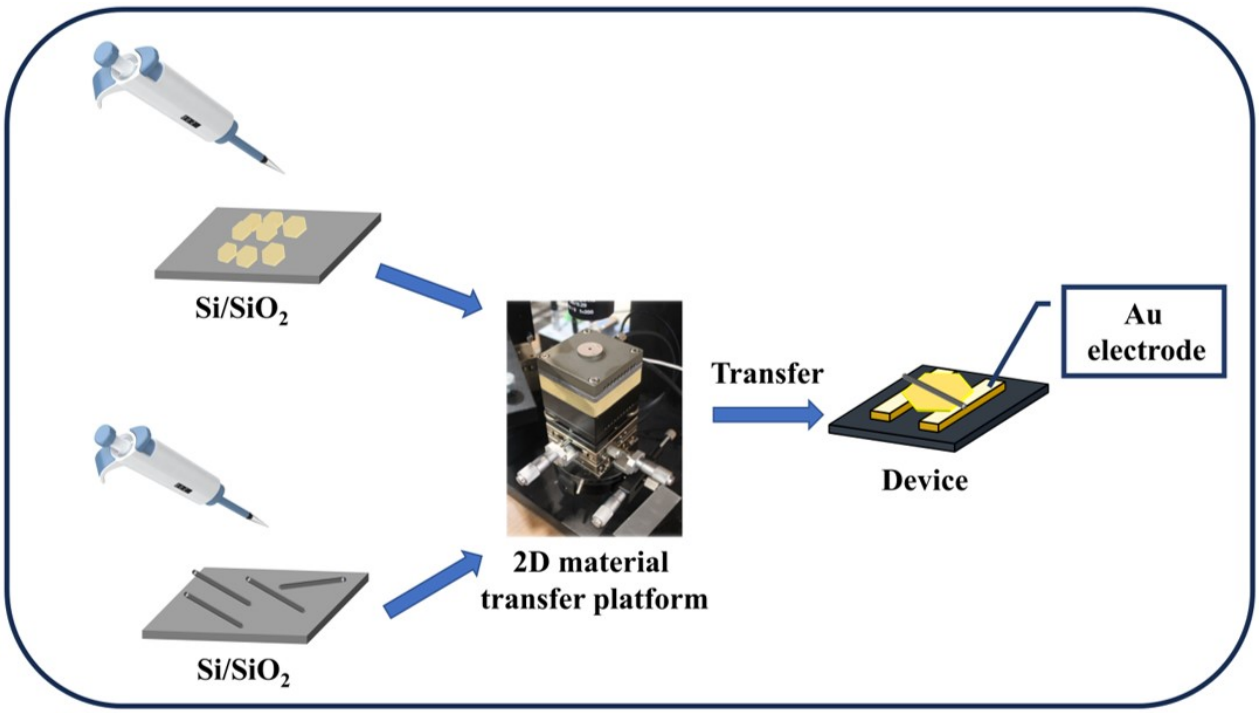
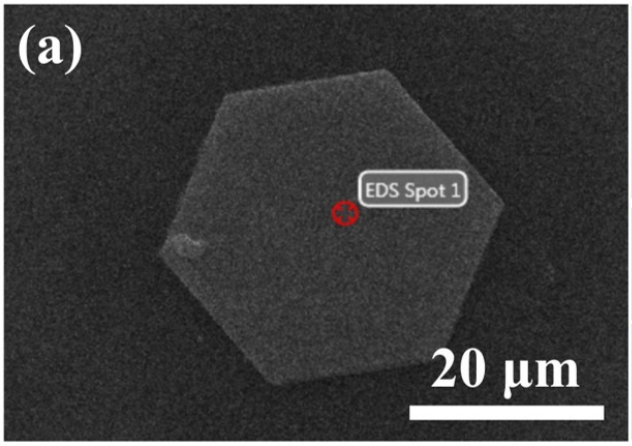


Figure S2. Schematic fabrication procedure of the 2D/1D PbI_2/Sb_2S_3 heterojunction device.



(b) Element	Weight %	Atom %
I L	56.25	67.73
Pb L	43.75	32.27

Figure S3. SEM image of a PbI_2 nanosheet (a) and corresponding EDX analysis result of I and Pb elements (b) from a spot selected from the near center region (red circle), showing the atomic ratio of Pb : I is near to 1 : 2.

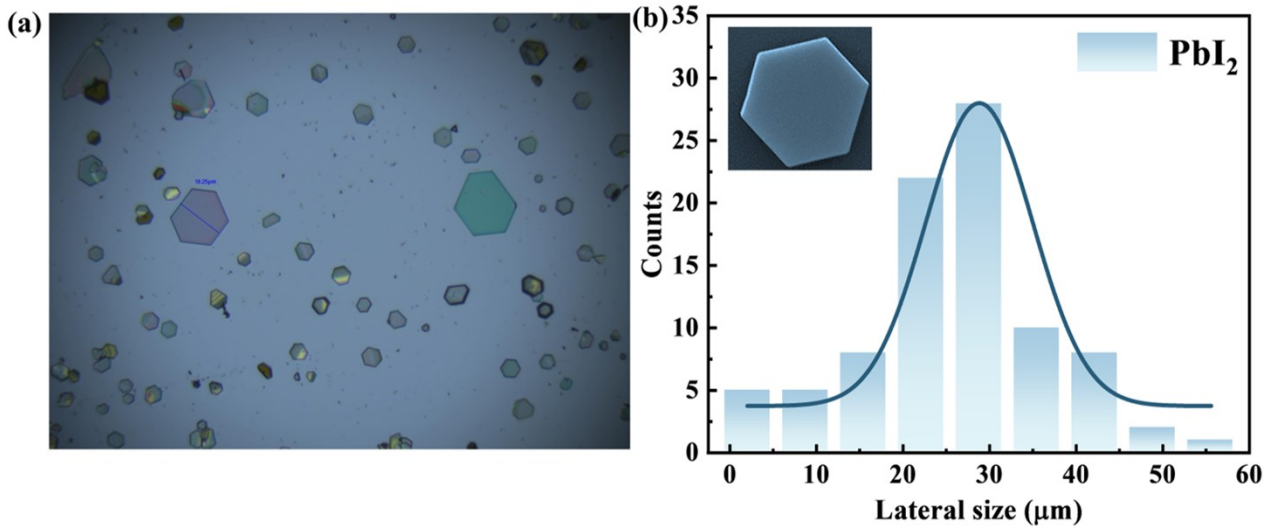


Figure S4. (a) Optical microscopy image of the PbI_2 nanosheets with a broad size dispersion; (b) statistical distribution of the lateral sizes of PbI_2 nanosheets.

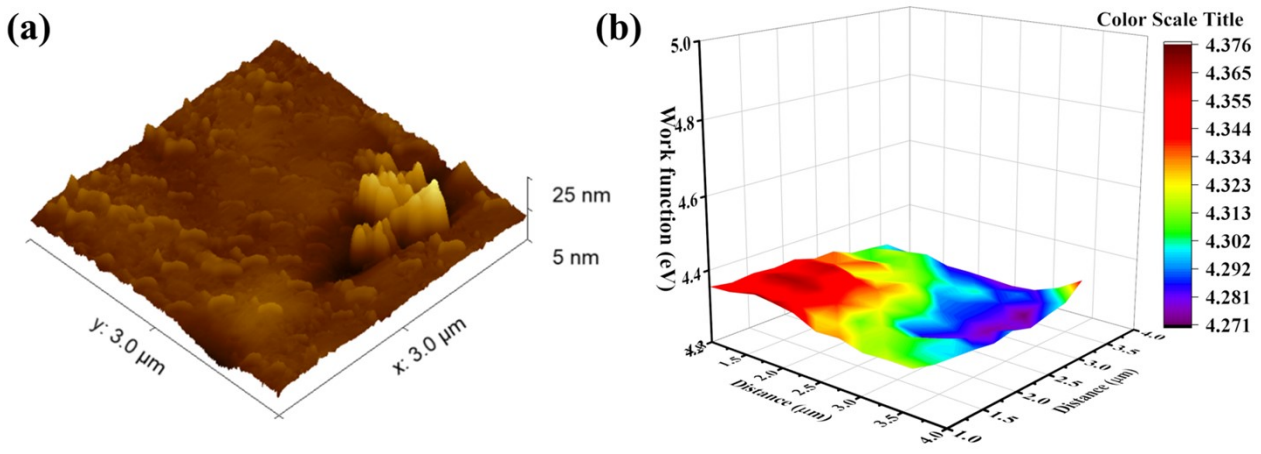


Figure S5. (a) AFM and (b) KPFM images of a selected rectangular area with a size of 3×3 μm^2 from a PbI_2 nanosheet, validating its relatively uniform surface and surface work function distribution.

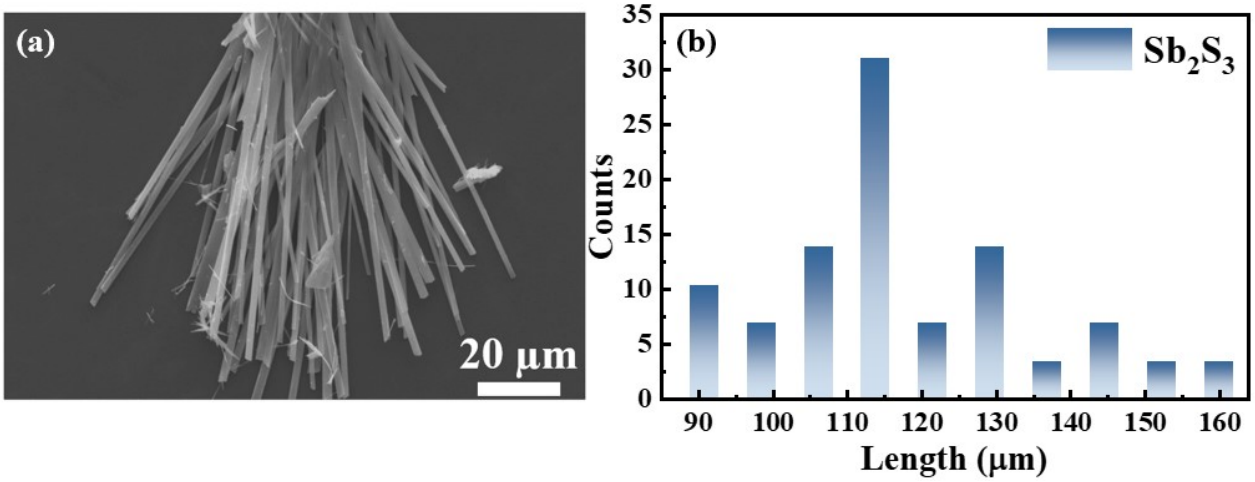


Figure S6. (a) SEM image of Sb_2S_3 microrods; (b) statistical size distribution of length of Sb_2S_3 microrods.

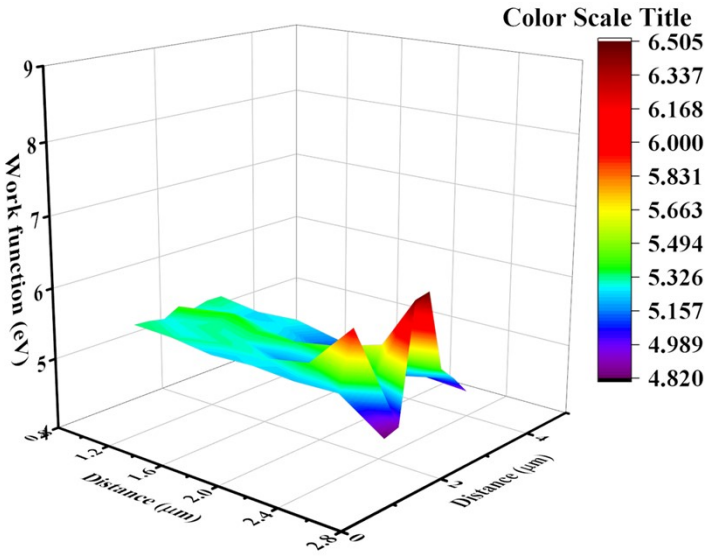


Figure S7. KPFM image of a selected rectangular area measuring 3×3 μm^2 from a Sb_2S_3 microrod.

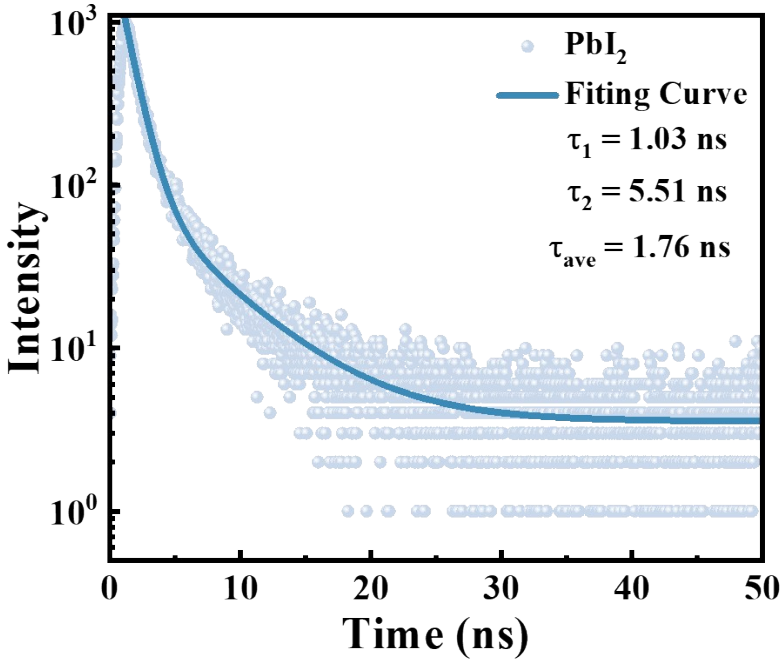


Figure S8. Time-resolved PL (TRPL) spectra of the PbI_2 nanosheets.

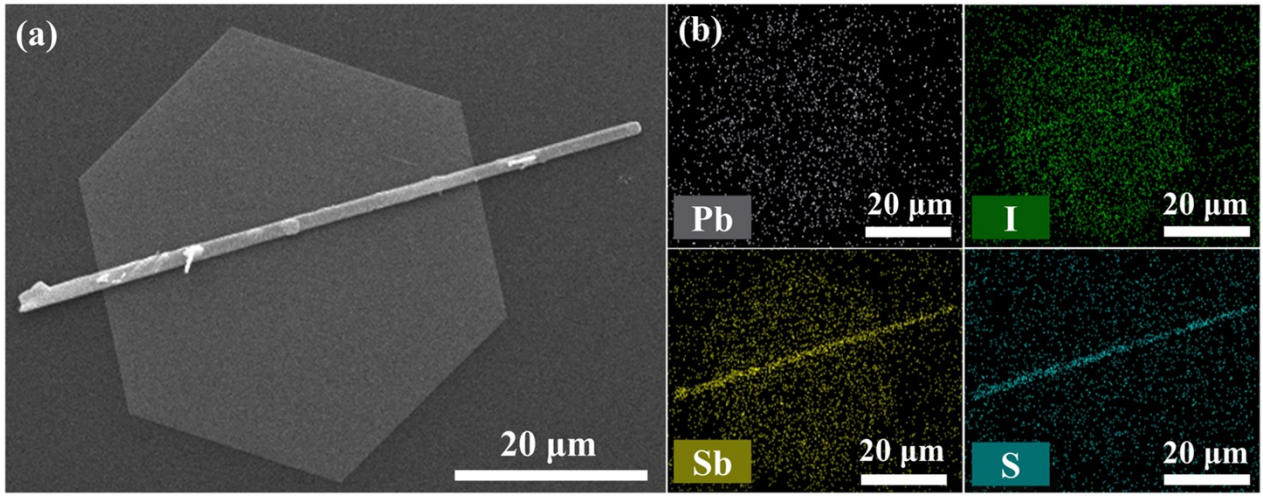


Figure S9. (a) SEM micrograph and (b) corresponding EDX mapping of Pb, I, Sb, and S elements in a 2D/1D PbI_2/Sb_2S_3 heterojunction.

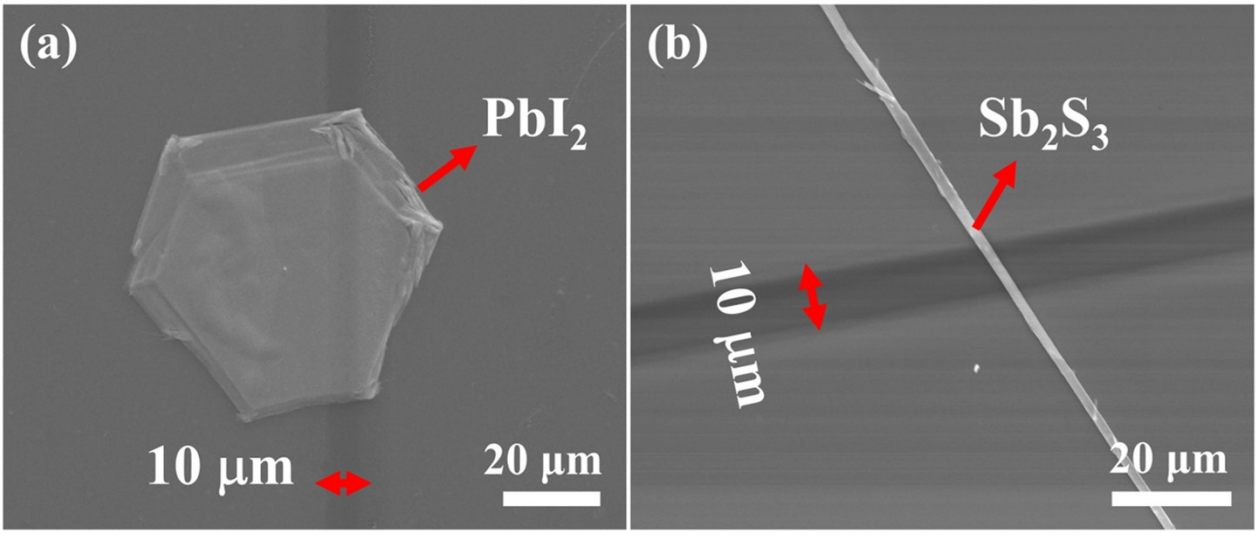


Figure S10. SEM images of (a) a PbI_2 and (b) Sb_2S_3 microrod photodetector device, respectively.

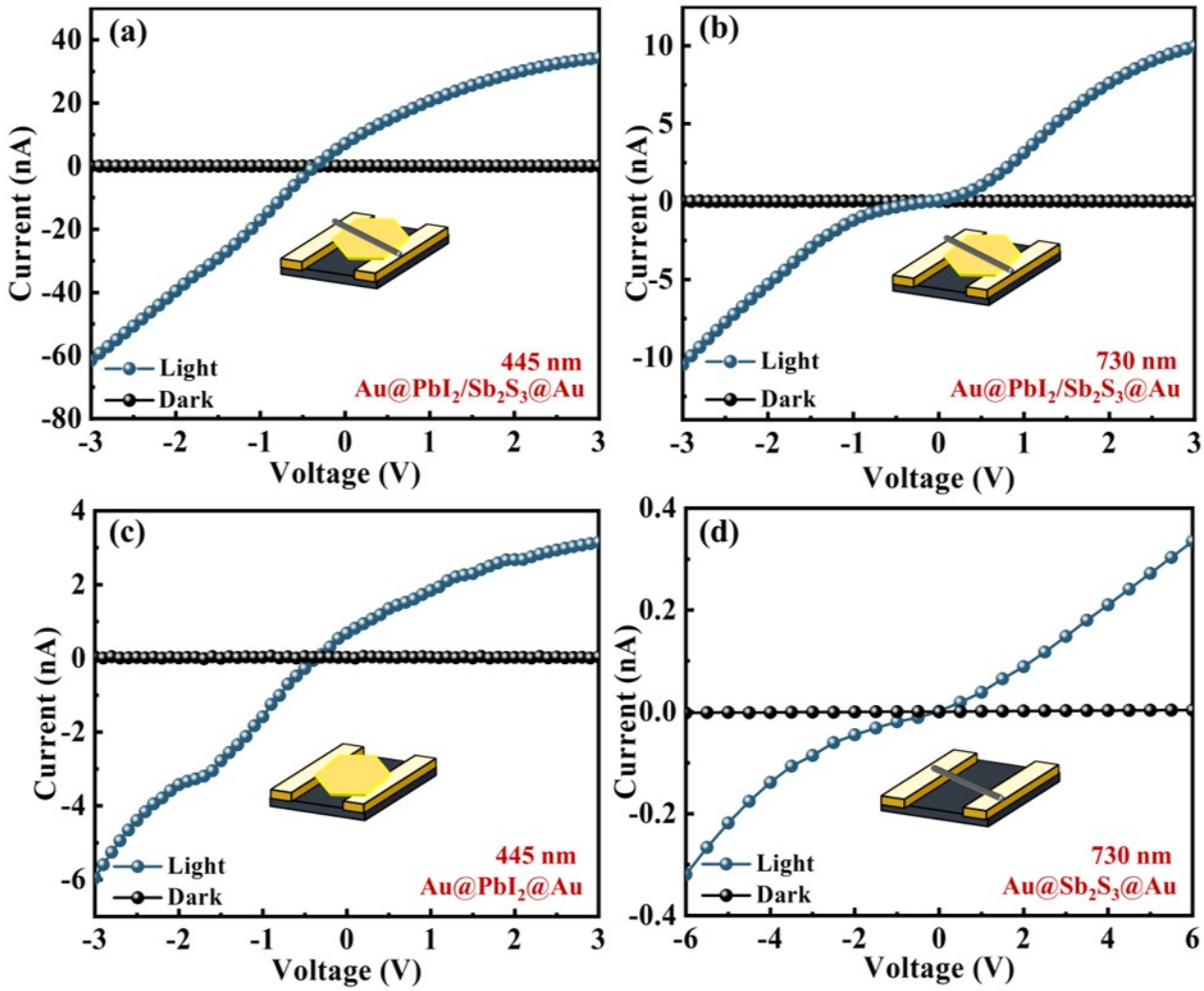


Figure S11. Current-voltage (*I-V*) curves of the PbI_2/Sb_2S_3 photodetector devices measured under dark and (a) 445 nm and (b) 730 nm light illumination, respectively; *I-V* curves of the (c) PbI_2 nanosheet and (d) Sb_2S_3 microrod photodetector devices measured under 445 nm and 730 nm illumination, respectively.

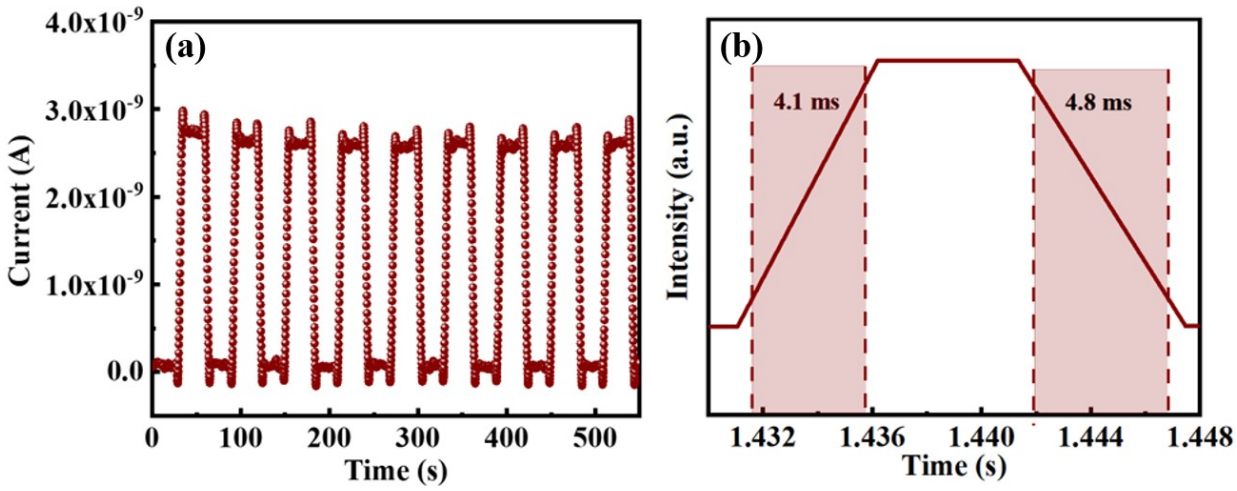


Figure S12. (a) Time-dependent photocurrent and (b) time response curves of an individual PbI_2 nanosheet device measured at 3 V bias under 445 nm monochromatic light.

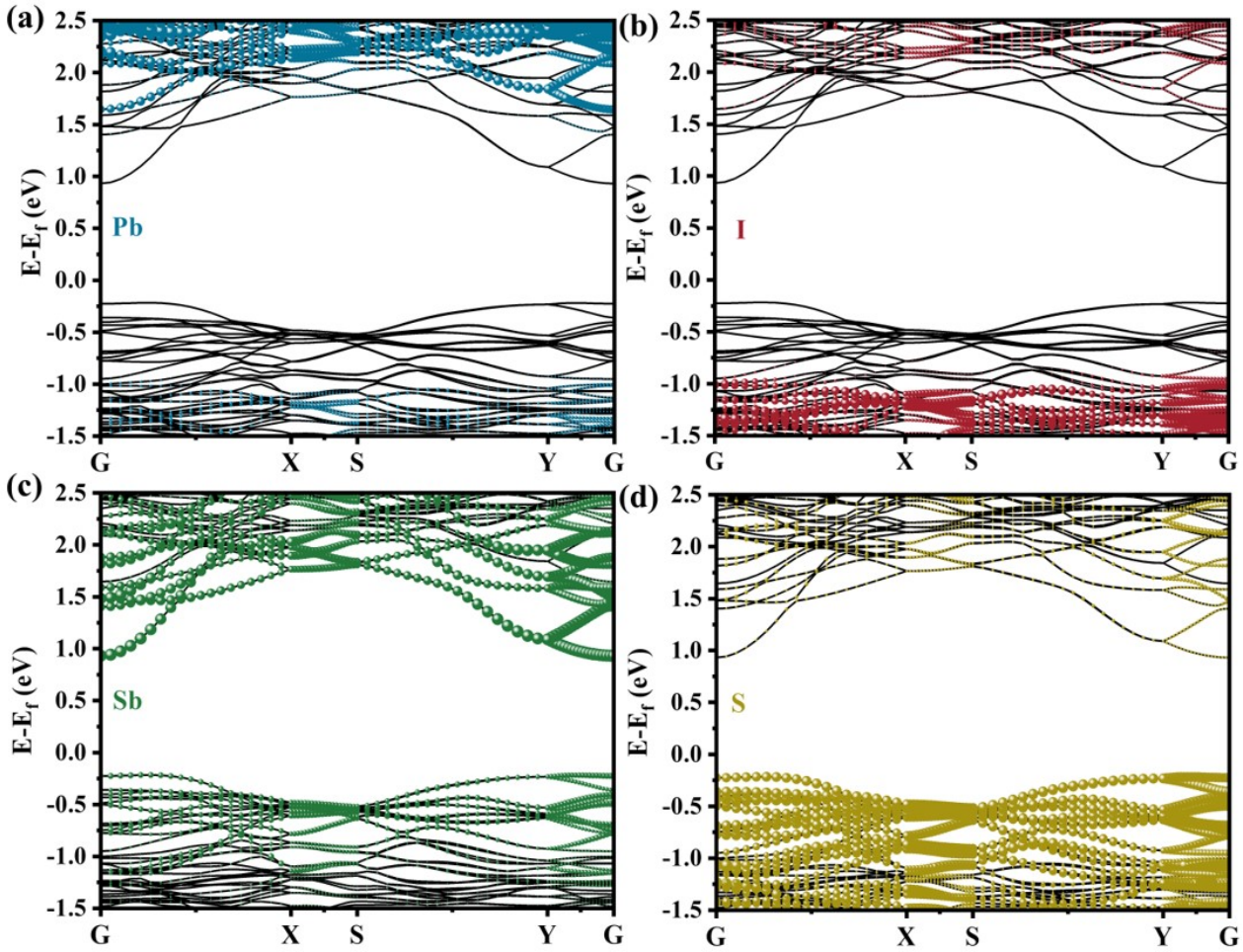


Figure S13. Energy band structure of the PbI_2/Sb_2S_3 heterostructure (black curve) with the respective contribution of (a) Pb (blue spheres), (b) I (red spheres), (c) Sb (green spheres), and (d) S (yellow spheres) element highlighted for clarity.