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

Supporting information

Centimeter-size Single Crystals of 2D Hybrid Perovskite for Shortwave Light Photodetection with Low Detection Limit

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Figures

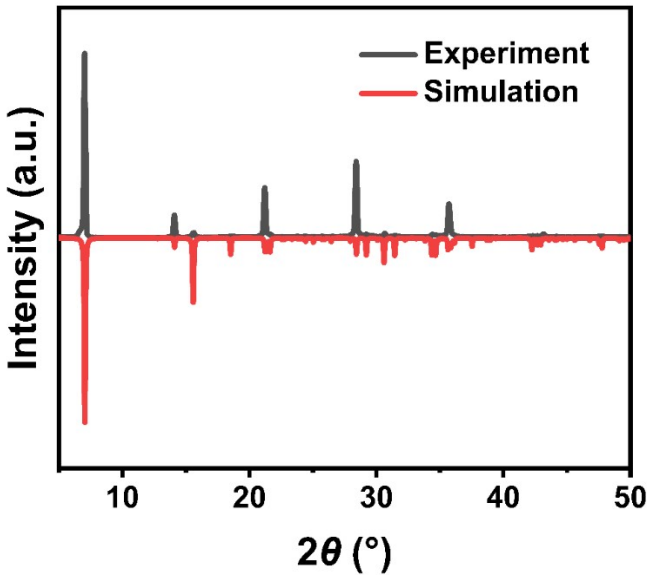

Figure S1. Experiment and simulation X-ray diffraction patterns of $(PA)_2PbBr_4$

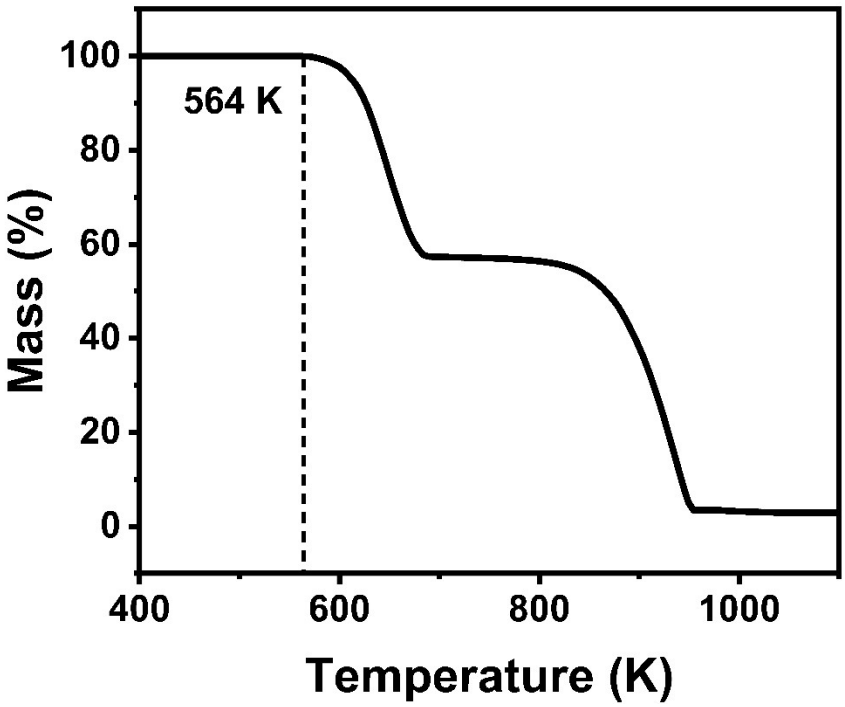

Figure S2. Thermogravimetric analysis curve of $(PA)_2PbBr_4$

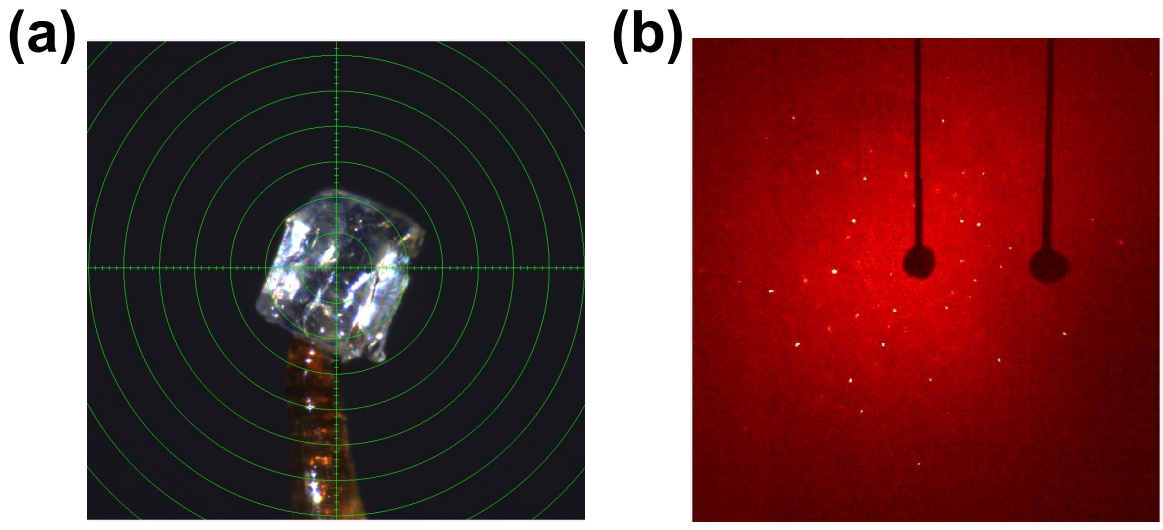

Figure S3. a) Image and b) SCXRD diffraction patterns of the $(PA)_2PbBr_4$ single crystal

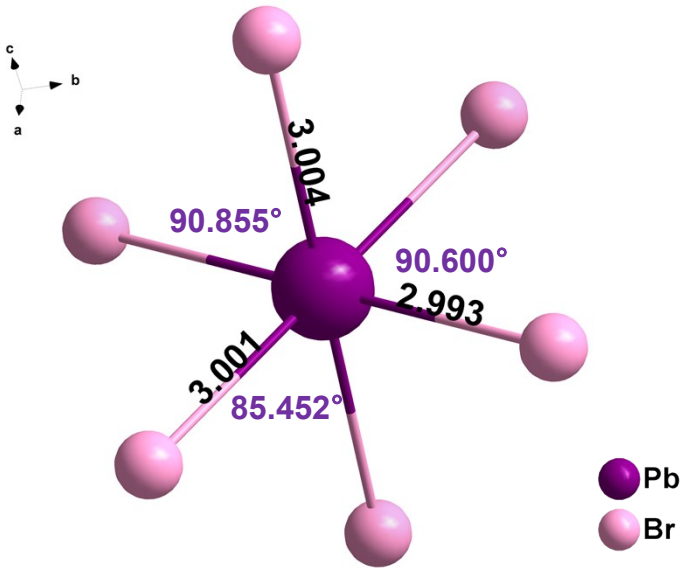

Figure S4. The bond length and bond angle of the [$PbBr_6$] octahedron.

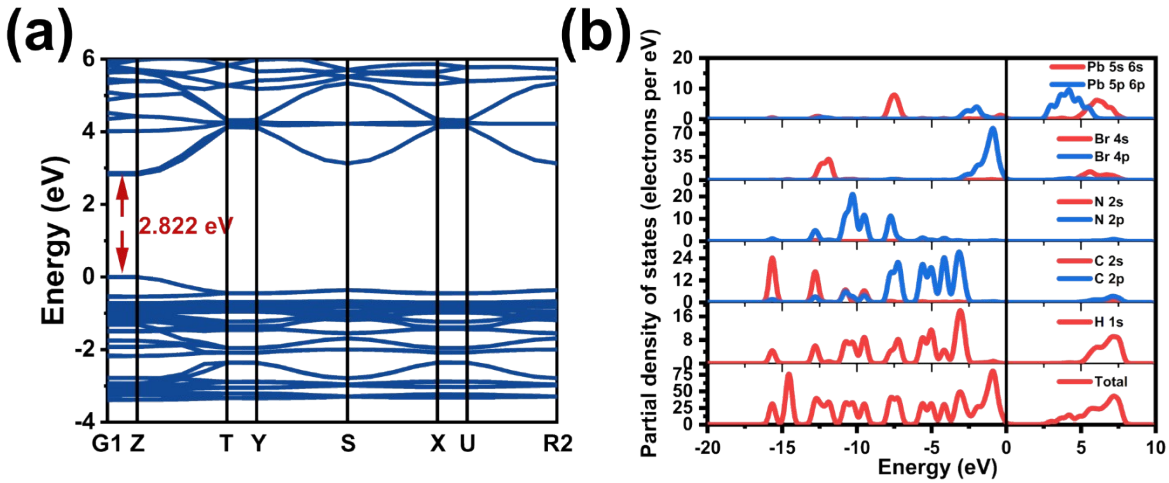

Figure S5. (a) Calculated band structure diagram and (b) partial density of states spectra of $(PA)_2PbBr_4$.

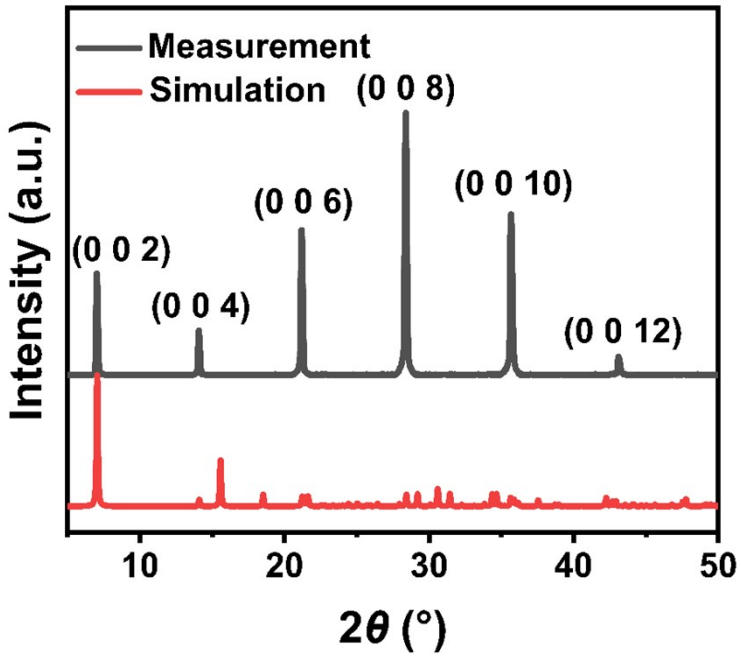

Figure S6. AFM images of the surface morphology of the bulk single crystals of $(PA)_2PbBr_4$.

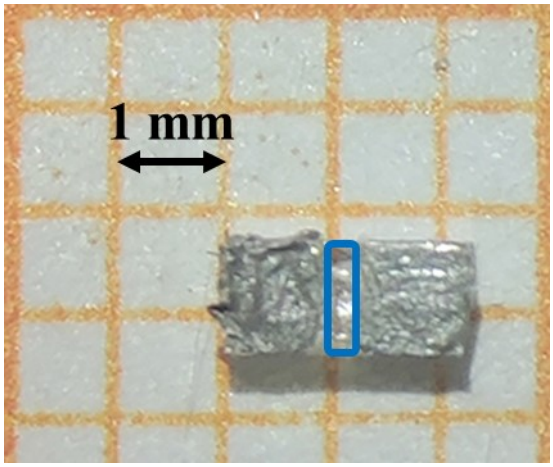

Fig. S7 Photoelectric devices diagram

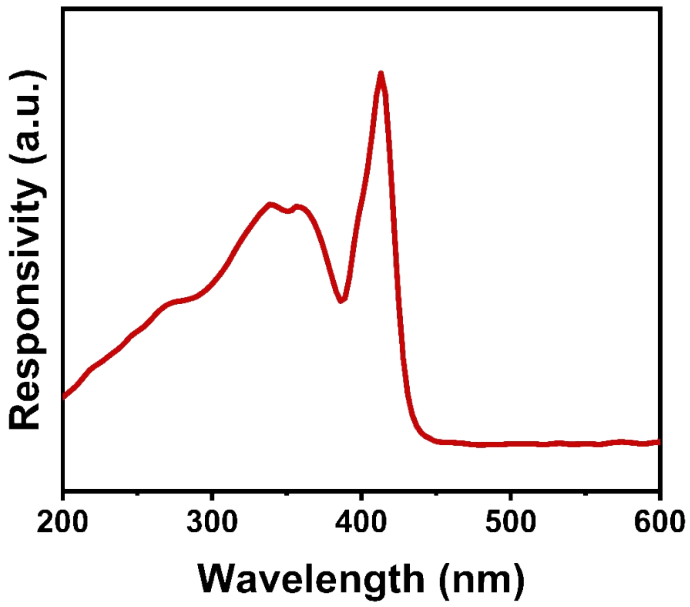

Fig S8. Spectral response of shortwave photodetector based on $(BA)_2PbBr_4$ under a bias voltage of 10 V.

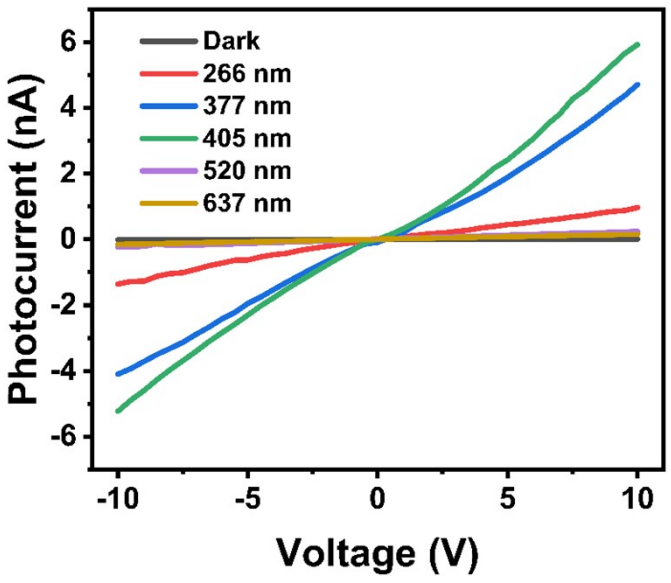

Figure S9. *I*−*V* diagram under different wavelength light.

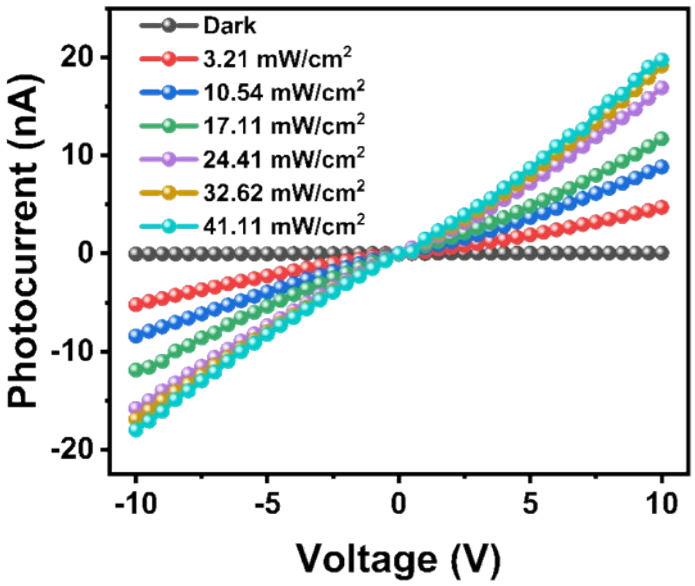

Figure S10. *I*–*V* diagram under strong illumination at 405 nm.

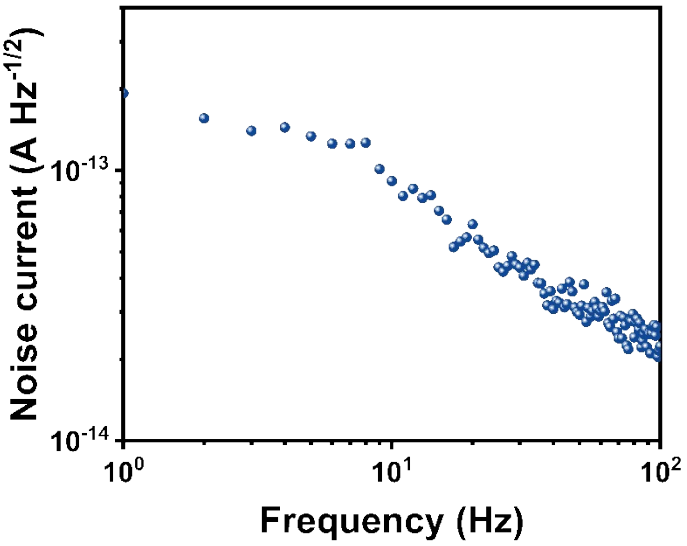

Fig S11. The measured noise current of the photodetector at different frequencies.

Table S1. Some similar reported photodetectors based on 2D hybrid perovskites.

Materials	Wavelength (nm)	Detection Limit	Detectivity (Jones)	Ref.
$(BA)_2PbBr_4$	377	80 nW/cm^2	2.06×10^{12}	[1]
$(BA)_2(MA)Pb_2Br_7$	405	1.2 μW/cm^2	1.1×10^{9}	[2]
$(BA)_2(MA)_2Pb_3Br_{10}$	405	2.13 mW/cm^2	3.6×10^{10}	[3]
$(BA)_2(FA)Pb_2Br_7$	405	82 nW/cm^2	1.47×10^{12}	[4]
$(BA)_2PbI_4$	420	0.2 mW/cm^2	-	[5]
$(PA)_2(FA)Pb_2I_7$	520	46 μW/cm^2	1.73×10^{14}	[6]
$(PA)_2(G)Pb_2I_7$	550	1.2 mW/cm^2	6.3×10^{12}	[7]
$(PA)_2(MA)Pb_2I_7$	600	8 mW/cm^2	2.92×10^{10}	[8]
$(i\text{BA})_2PbI_4$	560	113 μW/cm^2	1.23×10^{10}	[9]
$(PEA)_2SnI_4$	470	195.8 μW/cm^2	2.06×10^{11}	[10]
This work	405	20 nW/cm^2	6.02×10^{12}	

Reference

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