Supporting Information

Te microwire/2D Organic-inorganic Hybrid Perovskite Heterojunction Self-Powered Polarization Photodetector for Imaging and Communication Encoding

Yuxin Huang,[a] Pengfan Li,[a] Xuewei Yu,[a] Lin Sun,[a] Yanfeng Jiang [a] and Pingping Yu [*a,b]

[a] School of Integrated Circuits, Jiangnan University, Wuxi 214122, China;

[b] Jiangsu Provincial Key Laboratory of MEMS Sensors and ASIC Manufacturing Technology, Wuxi 214401, China
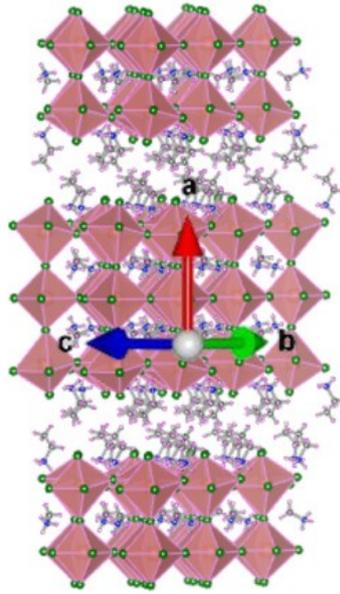
E-mail: pingpingyu@jiangnan.edu.cn

Fig. S1 Diagram of crystal packing for EMPC3.

Table S1

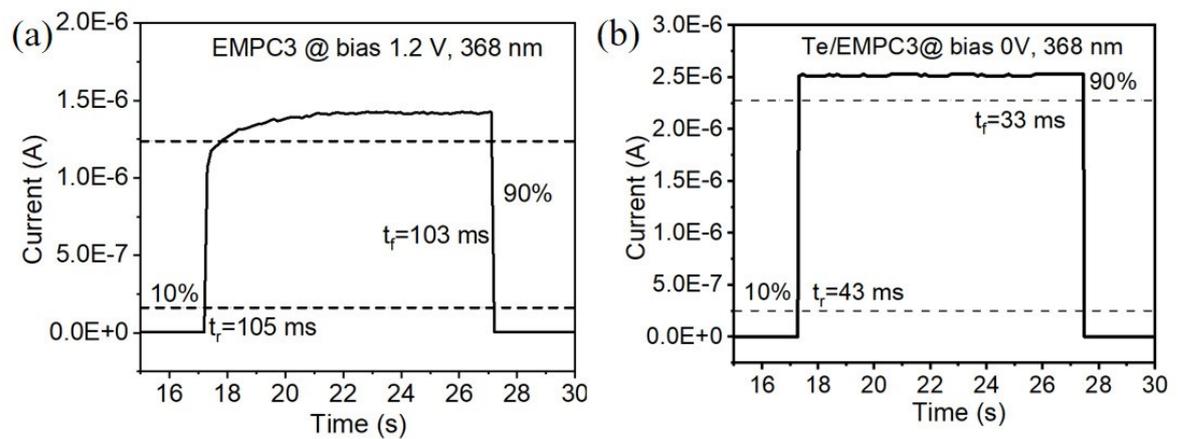| n value	General chemical formula	Structure Name	Inorganic layer thickness	Organic interlayer	Interlayer cation
1	EMPC1	Single-layer perovskite	Single-layer $[PbCl_6]^{4-}$	EA^+	/
2	EMPC2	Double-layer perovskite	Double-layer $[PbCl_6]^{4-}$	EA^+	MA^+
3	EMPC3	Three-layer perovskite	Three-layer $[PbCl_6]^{4-}$	EA^+	MA^+

Fig. S2 Rise and fall time of EMPC3 PD at 1.2V (a) and rise and fall time of Te/EMPC3 PD at 0V (b).
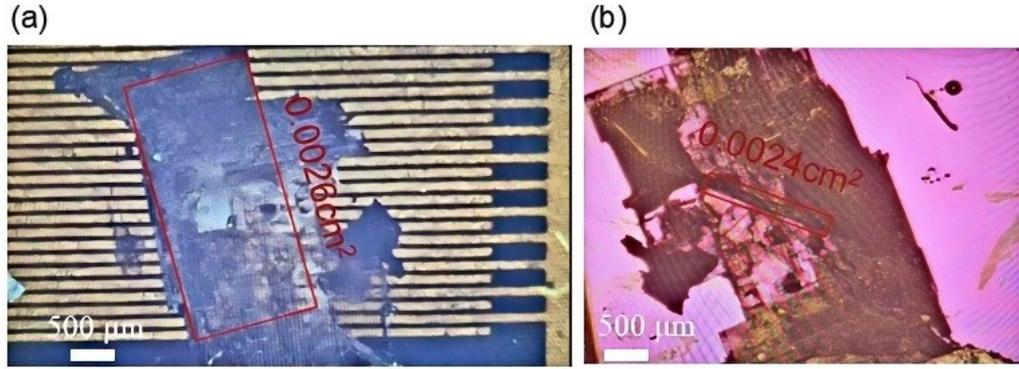
Fig. S3 Schematic representation of the actual light area of the EMPC3 (a) and the Te/EMPC3 heterojunction (b).

Table S2 The light intensity at different wavelength.

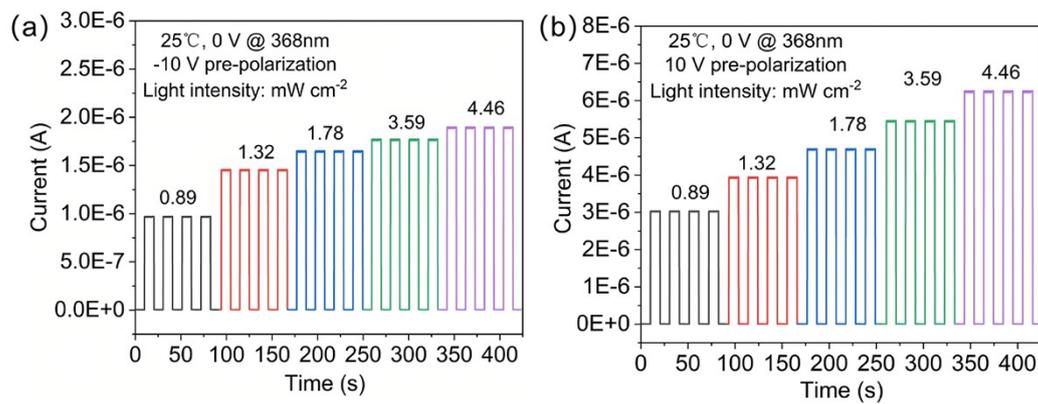| Wavelength (nm)	Light Intensity (mW cm^{-2})
280	0.40
368	1.32
410	1.24
500	1014
806	0.69
1006	0.71

Fig. S4 I-t curves of Te/EMPC3 PD at 368 nm, 0 V, 25 ℃, under -10 V (a) and 10 V (b) pre-polarization as function of power density.
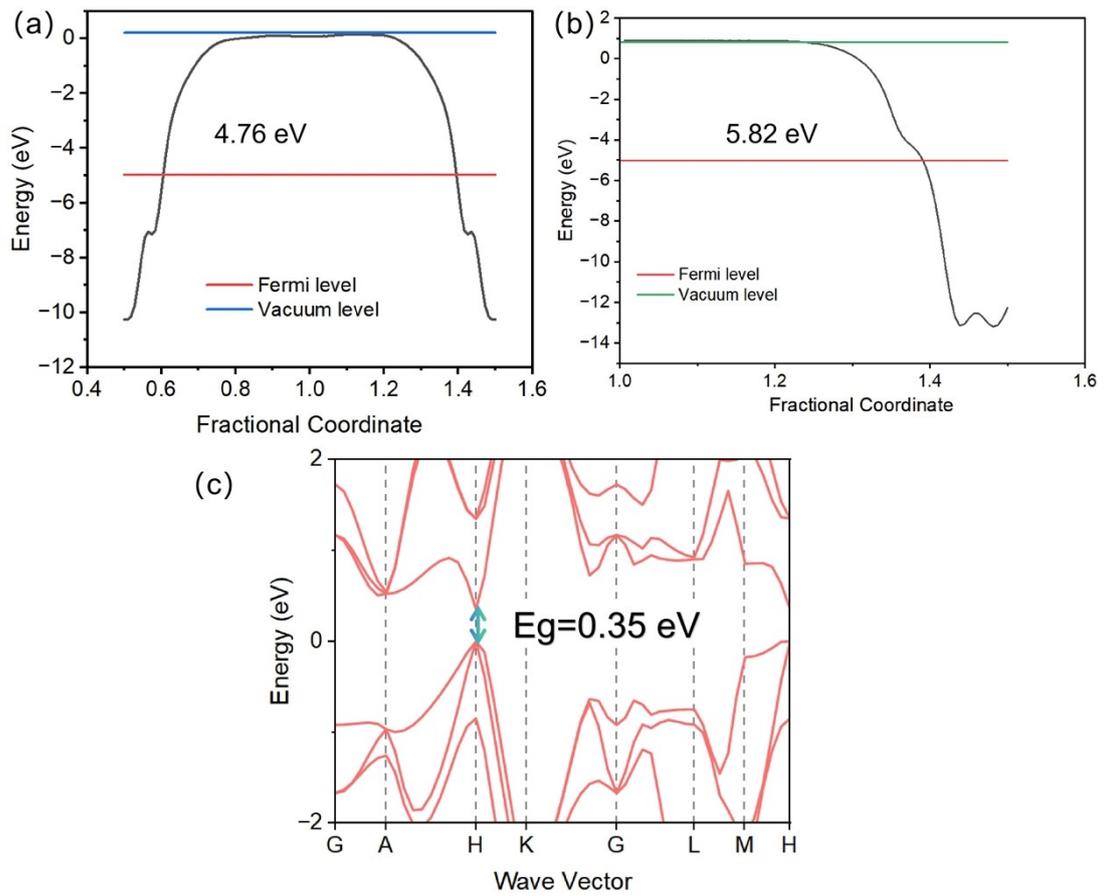
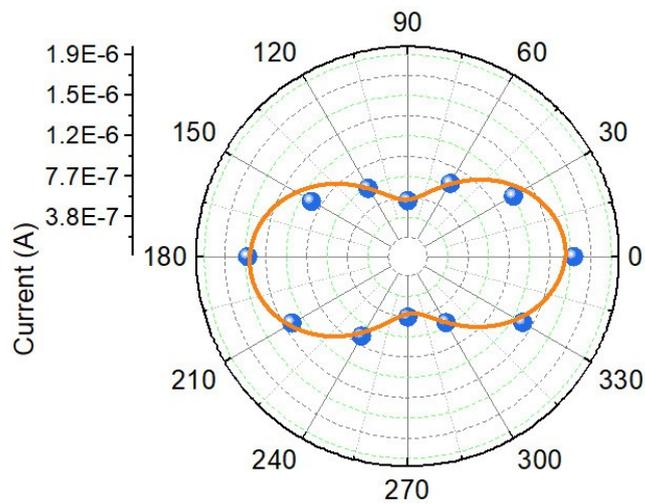Fig. S5 The Fermi level of Te (a) and EMPC3 (b). (c) Calculated electronic band structure of the Te.

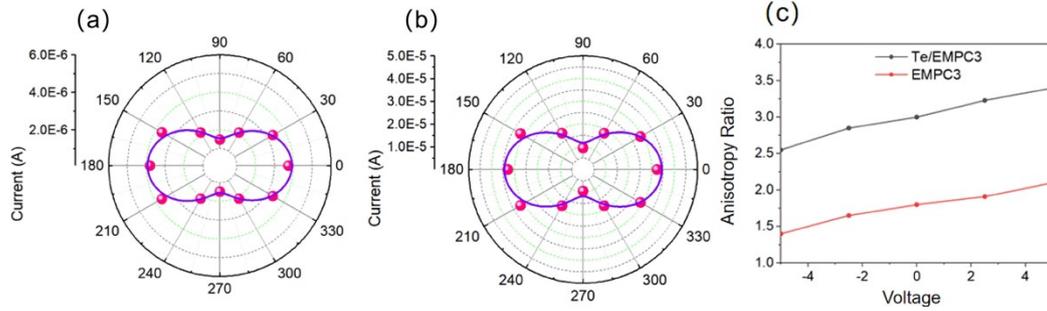**Fig. S6** Polar plot of the angle-resolved photocurrent of Te.

Fig. S7 Under 368 nm with the polarization direction rotated 360°, the angle-resolved photocurrent of the Te/EMPC3 device at -5 V (a) and 5 V (b) is represented in polar coordinates. Anisotropy ratio of Te/EMPC3 device under different bias voltages (c).

Table S3 The letter N corresponds to the actual electrode array current values at 0° and 90°, respectively.

0°	Row 1	Row 2	Row 3	Row 4	Row 5	Row 6
Column 1	2.01421E-9	2.01421E-9	2.01421E-9	2.01421E-9	2.01421E-9	2.01421E-9
Column 2	2.01421E-9	2.46913E-6	2.01421E-9	2.01421E-9	2.46913E-6	2.01421E-9
Column 3	2.01421E-9	2.46913E-6	2.46913E-6	2.01421E-9	2.46913E-6	2.01421E-9
Column 4	2.01421E-9	2.46913E-6	2.01421E-9	2.46913E-6	2.46913E-6	2.01421E-9
Column 5	2.01421E-9	2.46913E-6	2.01421E-9	2.01421E-9	2.46913E-6	2.01421E-9
Column 6	2.01421E-9	2.01421E-9	2.01421E-9	2.01421E-9	2.01421E-9	2.01421E-9

90°	Row 1	Row 2	Row 3	Row 4	Row 5	Row 6
Column 1	2.01421E-9	2.01421E-9	2.01421E-9	2.01421E-9	2.01421E-9	2.01421E-9
Column 2	2.01421E-9	8.33E-7	2.01421E-9	2.01421E-9	8.33E-7	2.01421E-9
Column 3	2.01421E-9	8.33E-7	8.33E-7	2.01421E-9	8.33E-7	2.01421E-9
Column 4	2.01421E-9	8.33E-7	2.01421E-9	8.33E-7	8.33E-7	2.01421E-9
Column 5	2.01421E-9	8.33E-7	2.01421E-9	2.01421E-9	8.33E-7	2.01421E-9

Column 6	2.01421E-9	2.01421E-9	2.01421E-9	2.01421E-9	2.01421E-9	2.01421E-9