Supporting Information

High-performance and self-powered polarization-sensitive photoelectrochemical-type Bi_2O_2Te photodetector based on quasi-solid-state gel electrolyte

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S1. SEM and AFM images of Bi_2Te_3 nanosheets before phase transition

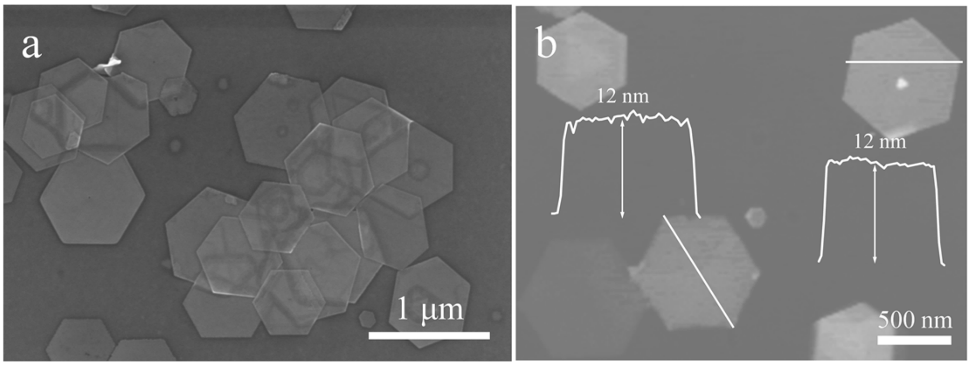

Fig. S1 a) SEM and b) AFM images of Bi_2Te_3 nanosheets before phase transition.

S2. Optical image of Bi_2O_2Te nanosheets deposited on a silicon substrate

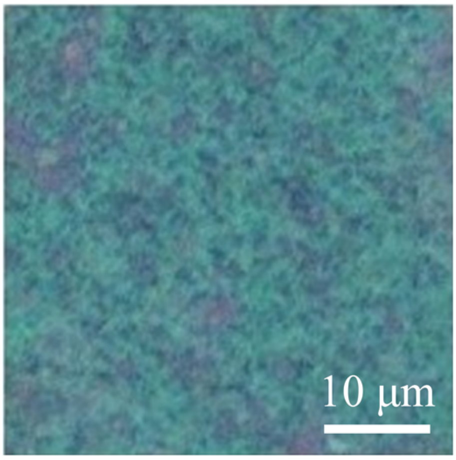

Fig. S2 a) Optical image of Bi_2O_2Te nanosheets deposited on a silicon substrate.

S3. UV-Vis absorption spectrum of Bi_2O_2Te nanosheets

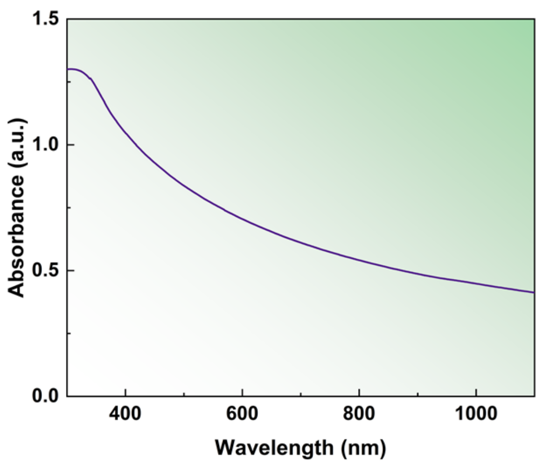

Fig. S3 UV-Vis absorption spectrum of Bi_2O_2Te nanosheets.

As shown in Fig. S3, there is light absorption in the wavelength range from 300 to 1100 nm, suggesting the potential application of Bi_2O_2Te nanosheets in UV-Vis-NIR optoelectronic devices.

S4. Transient photocurrent spike investigation under different illumination intensities

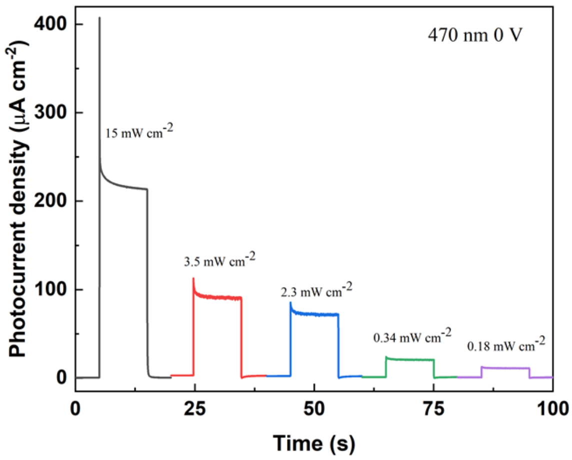

Fig. S4 Photoresponse curves under 470 nm illumination with incident power densities ranging from 0.18 to 15 mW cm^{-2}.

The photoresponse curves of the PEC-type Bi_2O_2Te photodetector under 470 nm illumination with different power densities are shown in Fig. S4. Clearly, the transient photocurrent spike of the PEC-type Bi_2O_2Te photodetector decreases significantly as the illumination power density decreases from 15 to 0.18 mW cm^{-2}.

S5. Photoresponse properties under pulsed light illumination with different frequencies

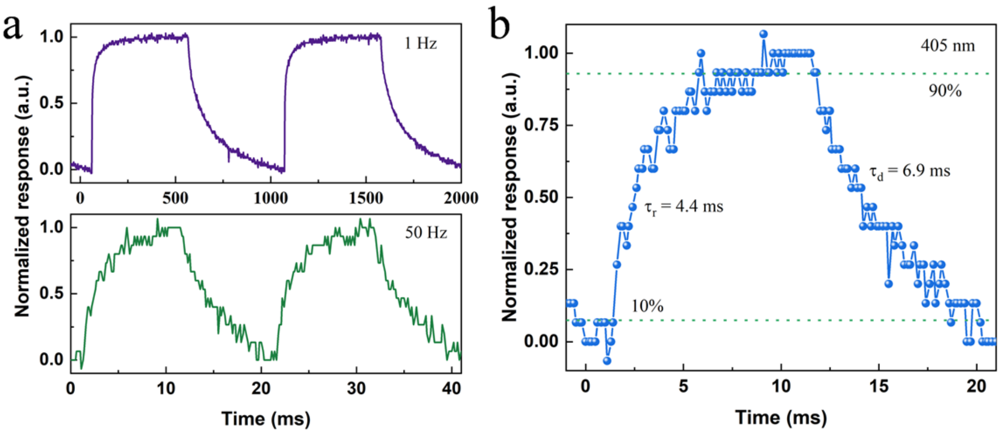

Fig. S5 a) Photoresponse curves of PEC-type Bi_2O_2Te photodetectors under pulsed light (405 nm) illumination at frequencies of 1 Hz and 50 Hz. b) Response speed at a switching frequency of 50 Hz.

The response speed of PEC-type Bi_2O_2Te photodetector to rapidly changing optical signals was characterized by an oscilloscope. As shown in Fig. S5 b, the rise/fall times of the photodetector are 4.4/6.9 ms under 405 nm illumination at a frequency of 50 Hz.

S6. Intensity of 520 nm laser at different polarization angles

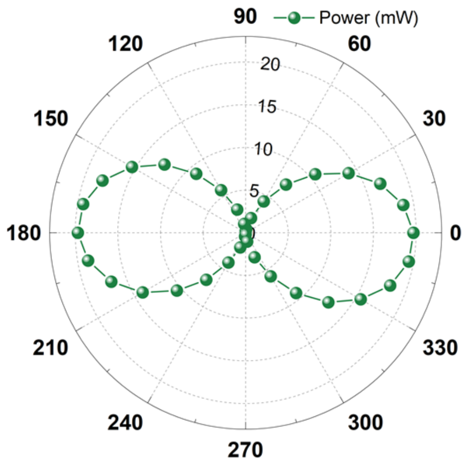

Fig. S6 Polar plot of the power of the 520 nm laser with different polarization angles.

S7. Polarization-dependent photocurrents at different bias

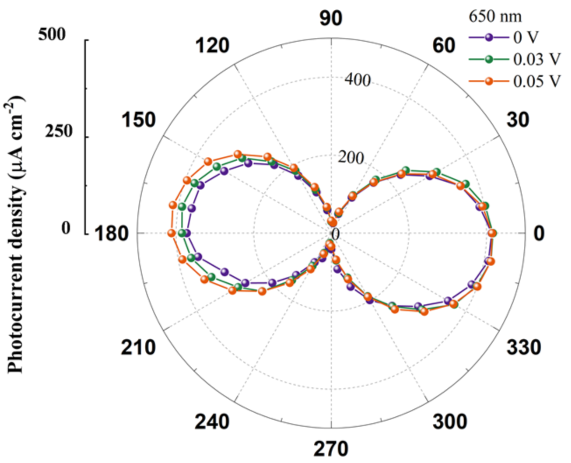

Fig. S7 Polar plot of polarization-dependent photocurrent of Bi_2O_2Te photodetector at different bias.