

**Supporting information**

**Tunable photocurrent switching behavior of ZnO/Cu<sub>2</sub>O**

**heterojunction photodetector to realize bipolar binary photoresponse**

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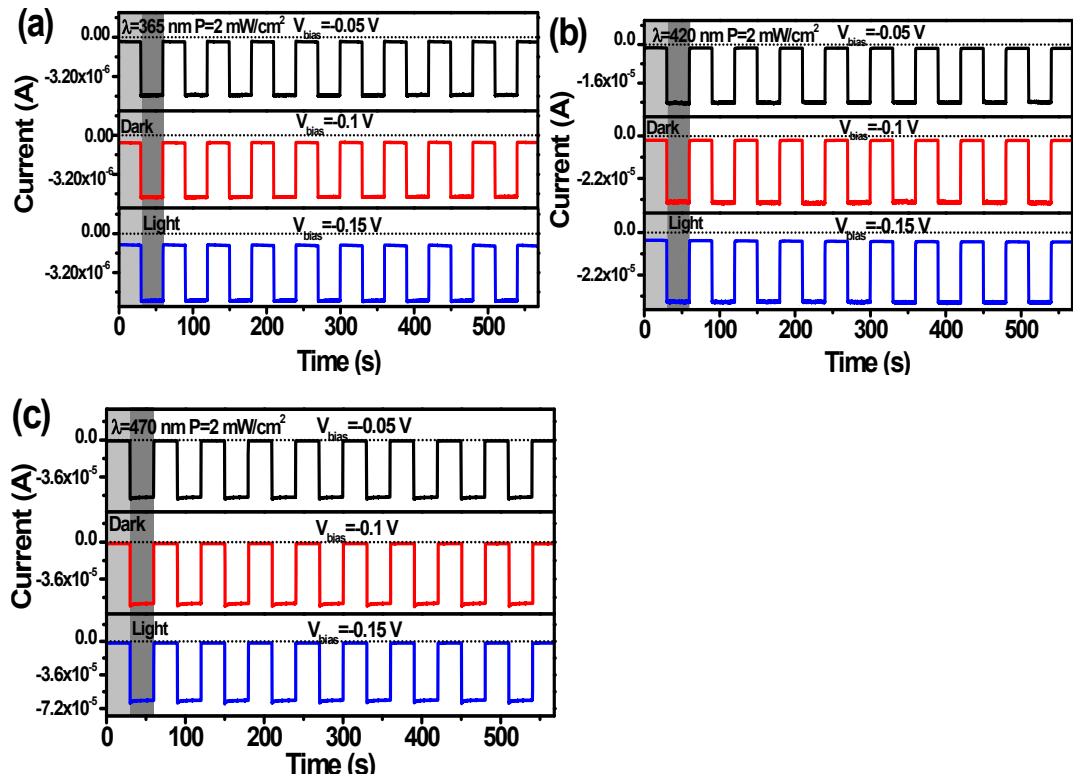


Fig.S1 I-t curves under the forward bias with the light intensity of 2 mW/cm<sup>2</sup> for (a) 365 nm, (b) 420 nm, (c) 470 nm UV and visible light.

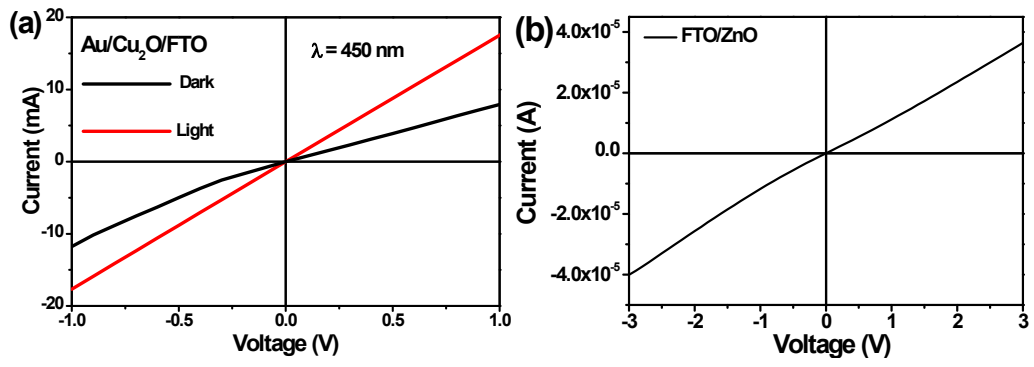


Fig.S2(a) I-V curve of ZnO/Cu<sub>2</sub>O heterojunction device in dark state, the inset is the I-V curve of Au/Cu<sub>2</sub>O/FTO, (b) I-V curve of FTO/ZnO/FTO in dark state

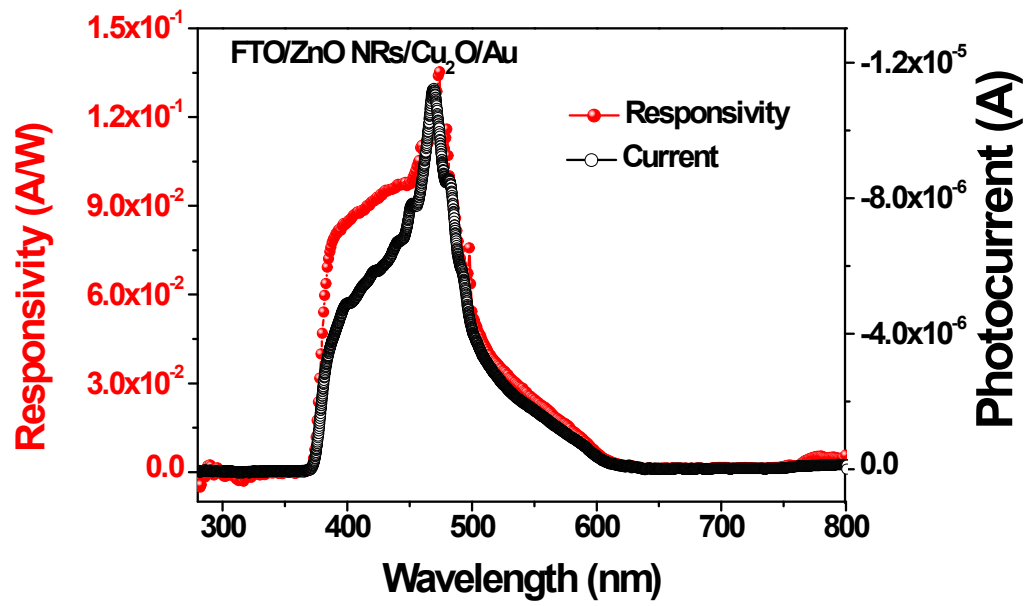


Fig.S3 The typical photocurrent and photoresponse of the device under different wavelengths of light without applied bias.

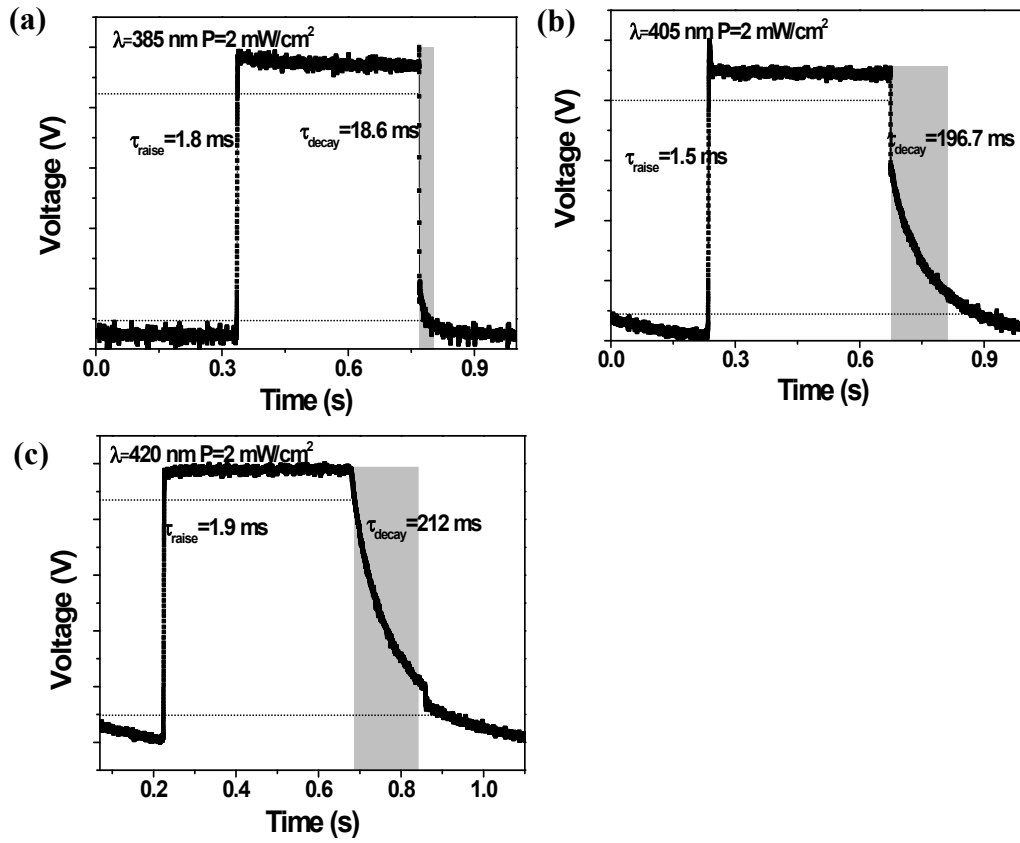


Fig.S4 The photoresponse time of the PD under (a) 385 nm, (b) 405 nm, (c) 420 nm UV and visible light illumination with the light intensity of  $2 \text{ mW/cm}^2$ .

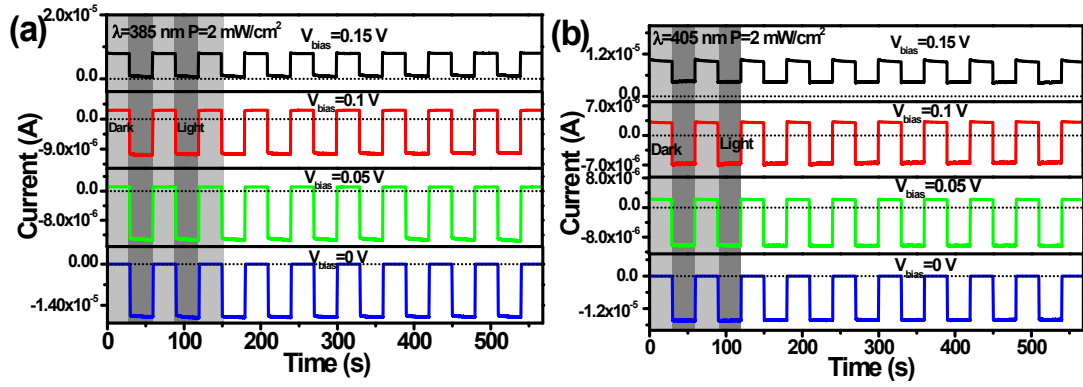


Fig.S5 I-t curves under different bias voltages and (a) 385 nm and (b) 405 nm light illuminations with the intensity of  $2\text{ mW/cm}^2$ .

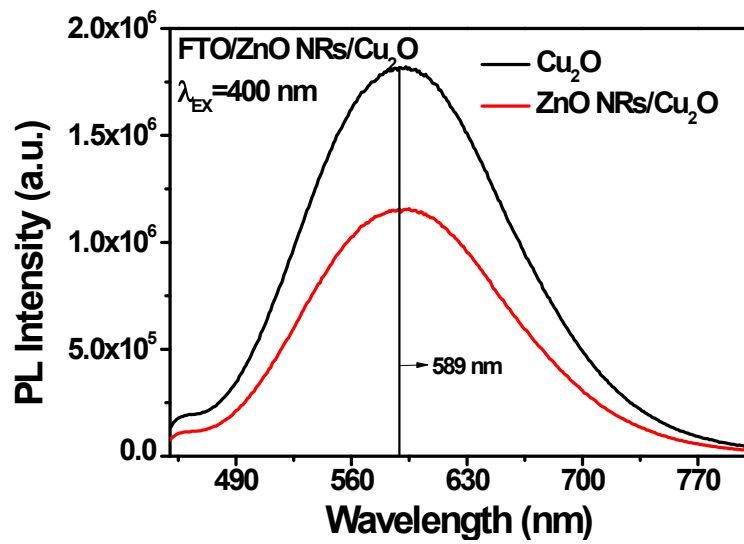


Fig.S6 PL spectra of ZnO NRs/Cu<sub>2</sub>O and Cu<sub>2</sub>O film excited by 400 nm light

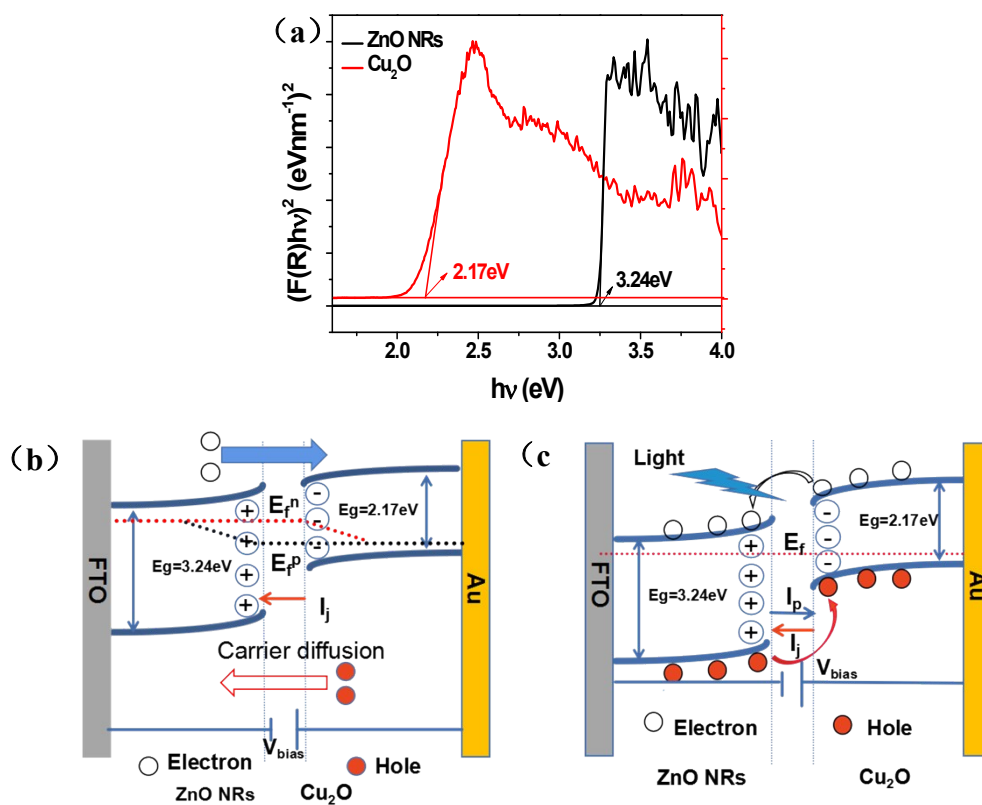


Fig.S7 (a) The estimated band gap energy from the UV-visible absorption spectra. Energy level structure diagrams of the PD under (b) applied bias voltage condition and (c) under light illumination and applied bias voltage conditions.



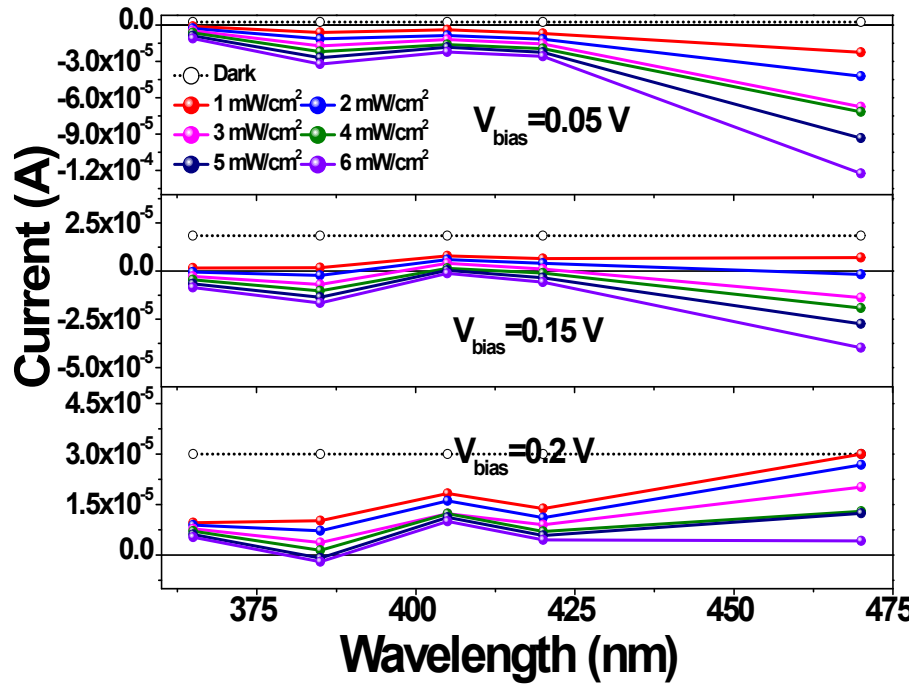


Fig.S8 The PD current curves under different light wavelengths and light intensity by applied 0.05,0.15 and 0.2 V bias voltage.