

**Regulated Self-powered Photoresponse Properties and Irradiance-
adaptable Behavior in Ferroelectric SrTiO₃/TiO₂ Heterojunction
Photodetectors**

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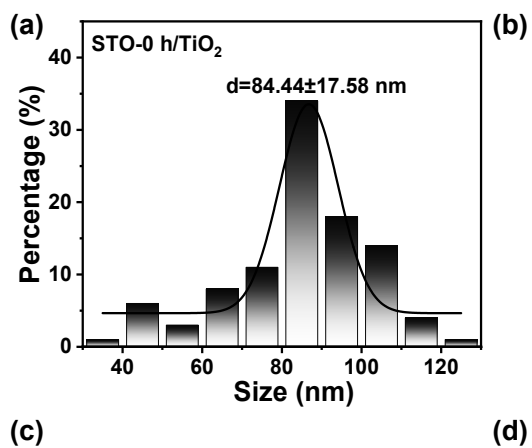


Fig. S1 Histograms of the coarse and fine size analysis of STO/TiO₂ NRs with different conversion time (a) 0 h, (b) 3 h, (c) 4 h and (d) 5 h.

Fig. S2 The cross-sectional SEM images of STO/TiO₂ NRs at different conversion time (a) 8 h and (b) 11 h.

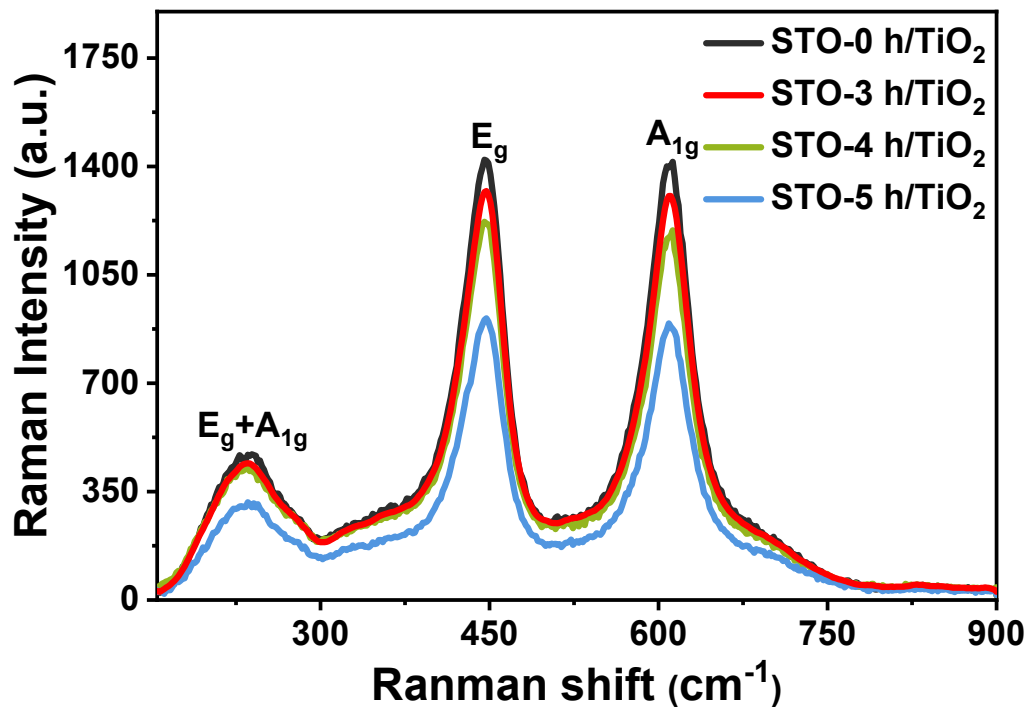


Fig. S3 The Raman spectra of STO/TiO₂ NRs at different conversion time (a) 0 h, (b) 3 h, (c) 4 h and (d) 5 h.

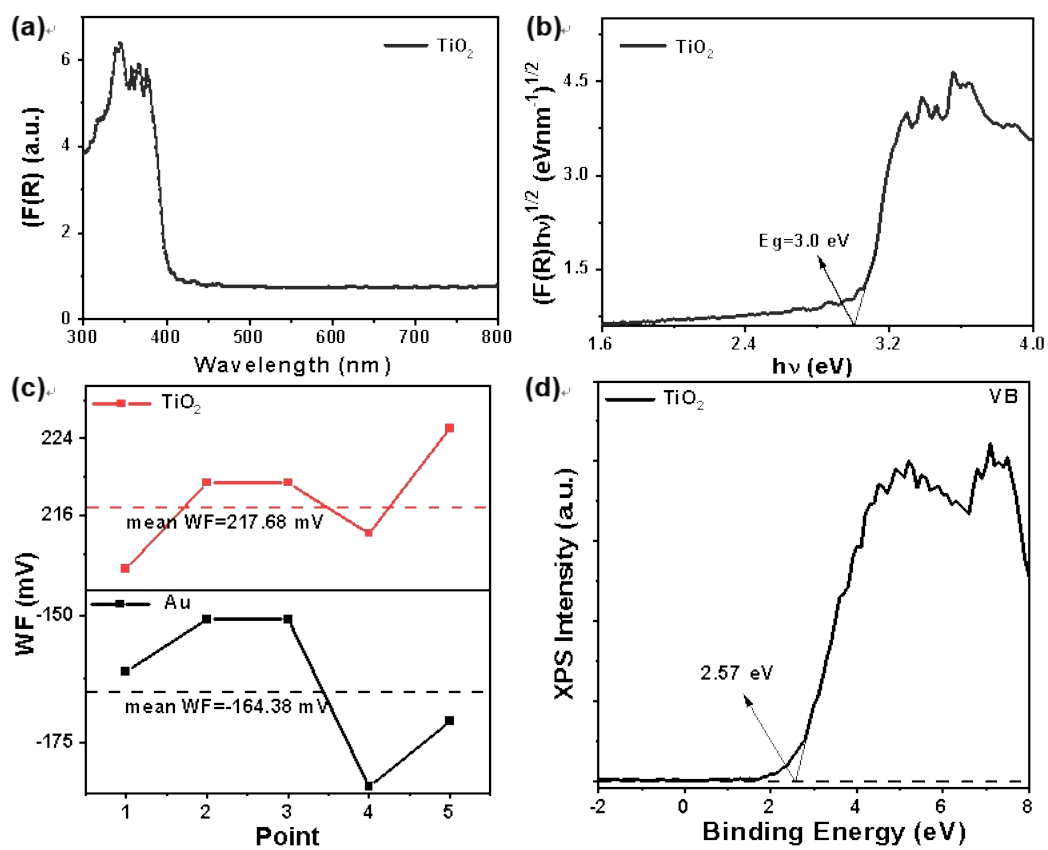


Fig. S4 (a) Absorption spectra derived from diffuse reflectance spectra, (b) optical band-gap, (c) work function measured by Kelvin probe and (e) valence band spectra of TiO₂ NRs.

Fig. S5 the I-V curves under dark (a) FTO/TiO₂/FTO, In/STO-11 h/In (b) and (c) In/STO/TiO₂/FTO for different conversion time. (d) The dark current of STO/TiO₂ PDs at zero bias for different conversion time.

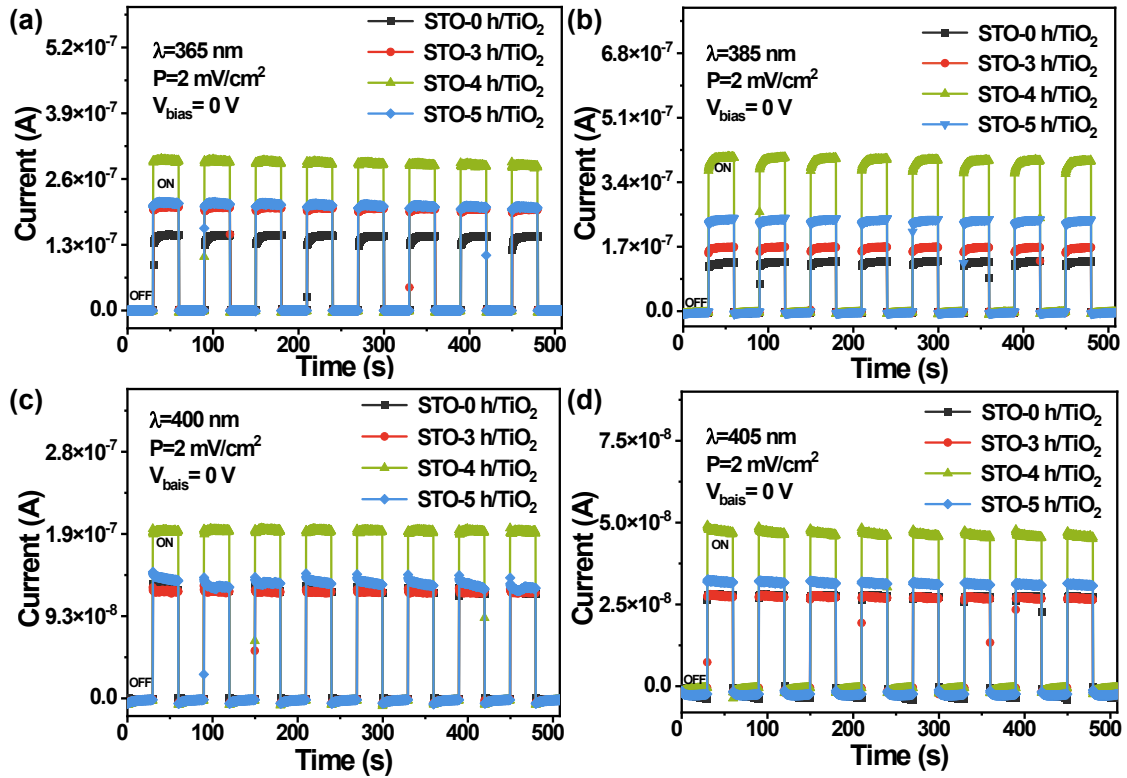


Fig. S6 I-t cycle curves of STO/TiO₂ PDs with different conversion time under different wavelength illumination: (a) 365 nm, (b) 385 nm, (c) 400 nm, and (d) 405 nm.

Fig. S7 (a) I-t curves and (b) responsivity curves of STO/TiO₂ photodetectors at different conversion times under different wavelengths of light.

Fig. S8 I-V curve (unpolarized) (a) and I-t curve at zero bias unpolarized (b), negative polarization (polarized at -5 V for 10 min) (c) and positive polarization (polarized at 5 V for 10 min) (d) of STO-4 h/TiO₂ PD under different light power densities of 375 nm illumination.

Table S1. Proportion of each element in STO/TiO₂ NRs prepared by different conversion time tested by EDS.

Samples	Component/At%			Atomic Ratio
	Sr	Ti	O	Sr: Ti
STO-0 h/TiO ₂	0	42.083	57.917	0
STO-3 h/TiO ₂	2.563	35.537	61.900	0.072
STO-4 h/TiO ₂	2.983	37.987	59.030	0.078
STO-5 h/TiO ₂	3.254	37.383	59.363	0.087

Table S2. The proportion of Ti1 and Ti2 in STO/TiO₂ NRs with different conversion time.

Samples	Percentage (%)	
	Ti1	Ti2
STO-0 h/TiO ₂	100	0
STO-3 h/TiO ₂	90.2	9.8
STO-4 h/TiO ₂	82.0	18.0
STO-5 h/TiO ₂	71.1	28.9

Table S3. The proportion of O1 and O2 in STO/TiO₂ NRs with different conversion time.

Samples	Percentage (%)	
	O1	O2
STO-0 h/TiO ₂	73.5	26.5
STO-3 h/TiO ₂	71.7	28.3
STO-4 h/TiO ₂	67.6	32.4
STO-5 h/TiO ₂	64.5	35.5

Table S4. Comparison of performance parameters of ferroelectric-based heterojunction self-driven PDs.

Photodetector	λ (nm)	R (A/W)	τ_r (ms)	τ_d (ms)	Ref.
NiO/PLZT	350	1.8×10^{-4}	0.34	0.36	1
ZnO/PLZT	360	4.0×10^{-3}	0.04	0.05	2
BEFO/NSTO	405	19.7	50	44	3
BGFO/ZnO	360	3.0×10^{-2}	9	2400	4
MoS ₂ -P(VDF-TrFE)	532	12	0.01-0.02	-	5
Graphene/LNO	1064	2.9×10^6	23	23	6
Perovskite/STO	550	0.73	200	<100	7
STO/TiO ₂	375	1.4×10^{-2}	6.4	31.5	This work

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