Supporting Information

Mechanism of a-Ga_2O_3/MoS_2 Heterojunction for High-Performance Self-Powered Solar-Blind Photodetection and Imaging

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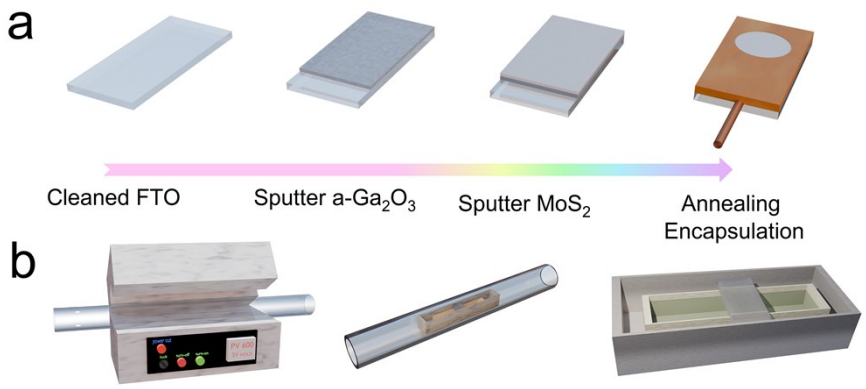


Figure S1 (a) Fabrication process of the a-Ga_2O_3/MoS_2; (b) Schematic illustration of the high-temperature sulfurization process.

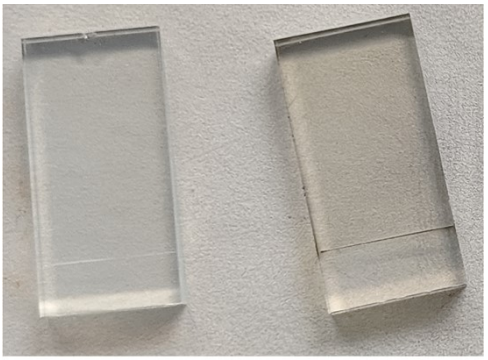
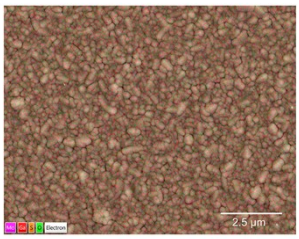
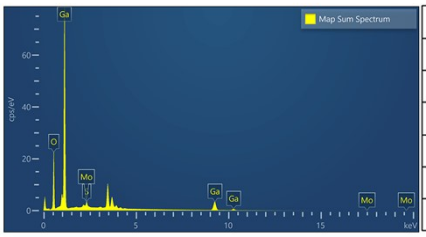


Figure S2 Left panel: sample with only a-Ga_2O_3 sputtered on FTO; Right panel: sample with a-Ga_2O_3/MoS_2 heterostructure sputtered on FTO.

a



b



Map Sum Spectrum	
Element	Atomic %
O	58.14
S	1.61
Ga	40.05
Mo	0.20
Total:	100.00

Figure S3 (a) EDS image of the a-Ga_2O_3/MoS_2 heterojunction device; (b) Corresponding elemental mapping spectra and quantitative content analysis for selected area (a).

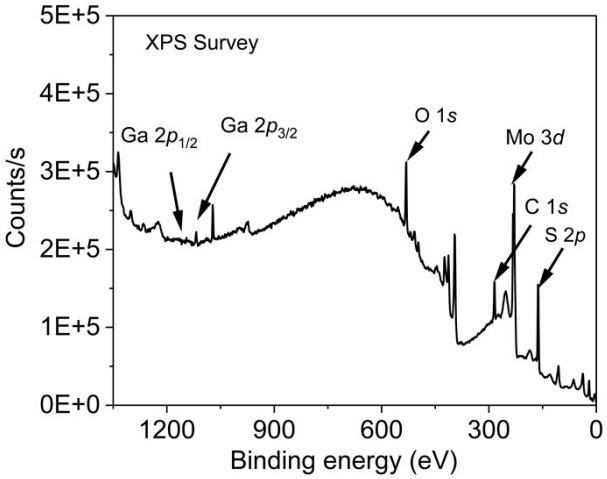


Figure S4 XPS survey spectrum of the a-Ga_2O_3/MoS_2 heterojunction device surface.

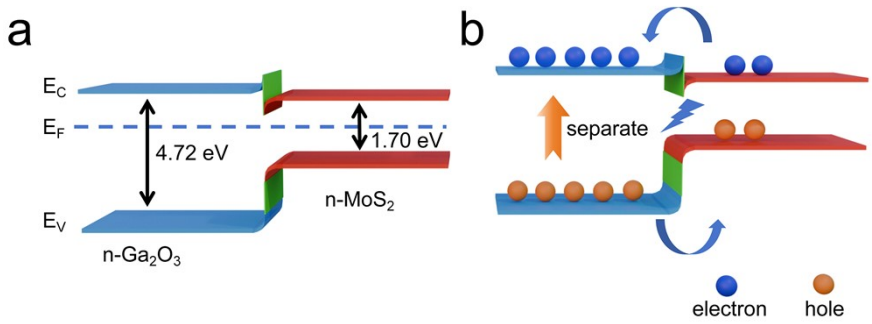


Figure S5 (a) Schematic energy band diagram illustrating the band bending after Fermi level alignment between a-Ga_2O_3 and MoS_2. (b) Schematic illustration of carrier separation and transport under 254 nm illumination.

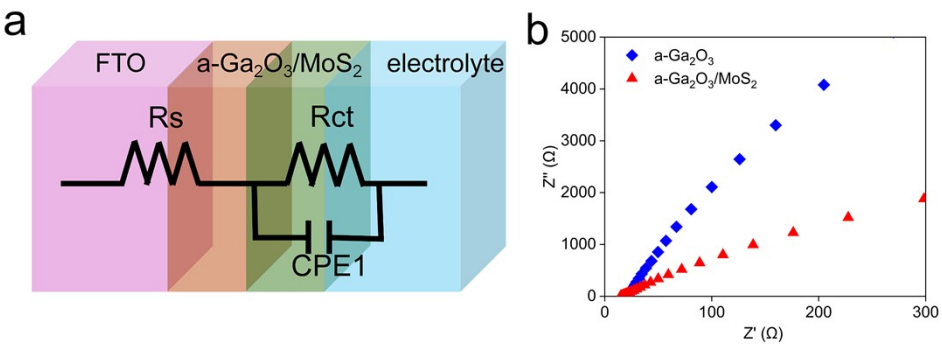


Figure S6 (a) Equivalent circuit diagram used for fitting the Mott-Schottky measurements; (b) Fitted Mott-Schottky plot.

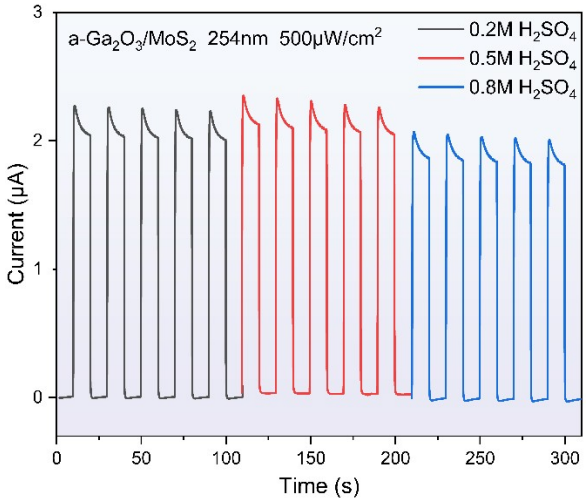


Figure S7 I-t curves of the a-Ga_2O_3/MoS_2 ultraviolet photodetector measured in H_2SO_4 electrolytes with concentrations of 0.2, 0.5, and 0.8 M.

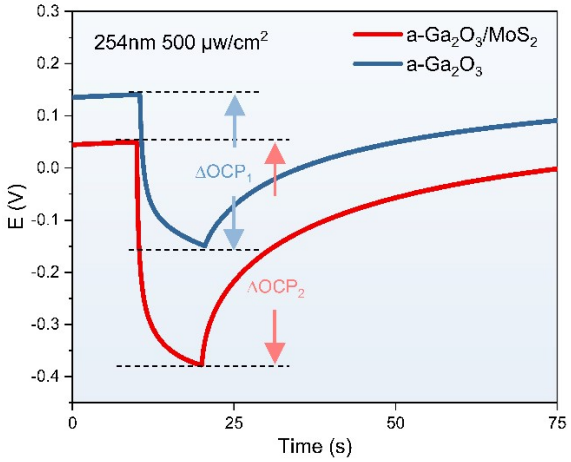
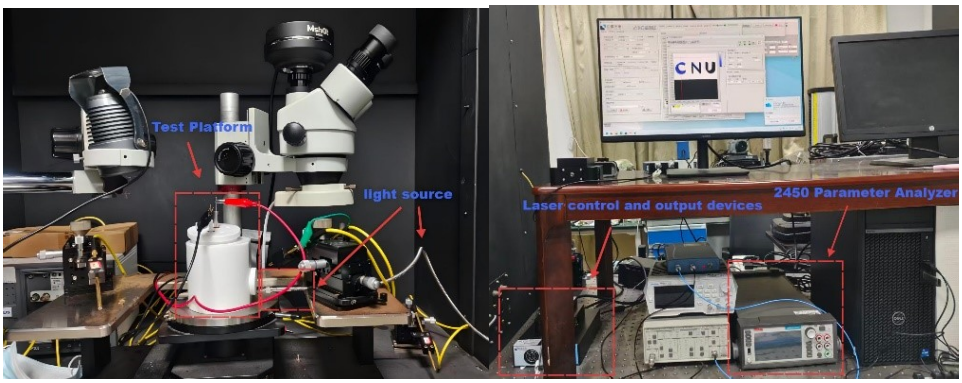


Figure S8 OCP profiles of the a-Ga_2O_3/MoS_2 heterojunction versus the pristine a-Ga_2O_3 device under intermittent illumination.



（a） （b）

Figure S9 (a) Schematic of the testing platform. (b) Instrumentation for laser control and data acquisition.

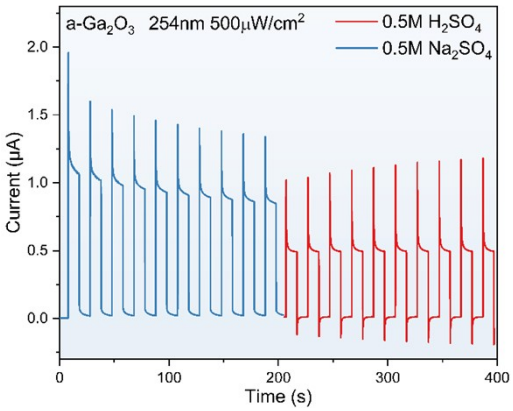


Figure S10 I-t of the a-Ga_2O_3 photoelectrode in neutral and acidic electrolytes.

Table S1 Performance benchmarking of Ga_2O_3-based materials for ultraviolet photodetection in recent literature.

Materials	R	D*	T_r/T_d	reference
β-Ga_2O_3@a-Ga_2O_3	48.4 mA/W	8.0×10^{11}	125 ms/160 ms	[1]
γ-Ga2O3	5.22 mA/W	3.12×10^{11}	0.35 s/0.32 s	[2]
α-Ga_2O_3/Cu_2O	4.57 mA/W	2.107×10^{9}	0.815 s/0.978 s	[3]
Sn doped β-Ga_2O_3	63.79 mA/W	9.58×10^{11}	1.01 s/0.19 s	[4]
α-Ga_2O_3/Nb_2CT_X	35.4 mA/W	2.6×10^{11}	0.2 s/0.1 s	[5]
β-Ga_2O_3	1.7 A/W	\	2.2 s/2.2 s	[6]
Mg-doped α-Ga_2O_3	34.54 mA/W	6.36×10^{11}	0.29 s/0.14 s	[7]
a-Ga_2O_3/MoS_2	33.03 mA/W	2.46×10^{11}	24 ms/51 ms	This work

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