

Supplementary information

**ALD oxygen vacancy-rich amorphous Ga<sub>2</sub>O<sub>3</sub> on three-dimensional urchin-like ZnO arrays for high-performance self-powered solar-blind photodetectors**

Dangwu Ni, Yijie Wang, Aoshuang Li, Lin Huang, Huili Tang, Bo Liu, Chuanwei Cheng

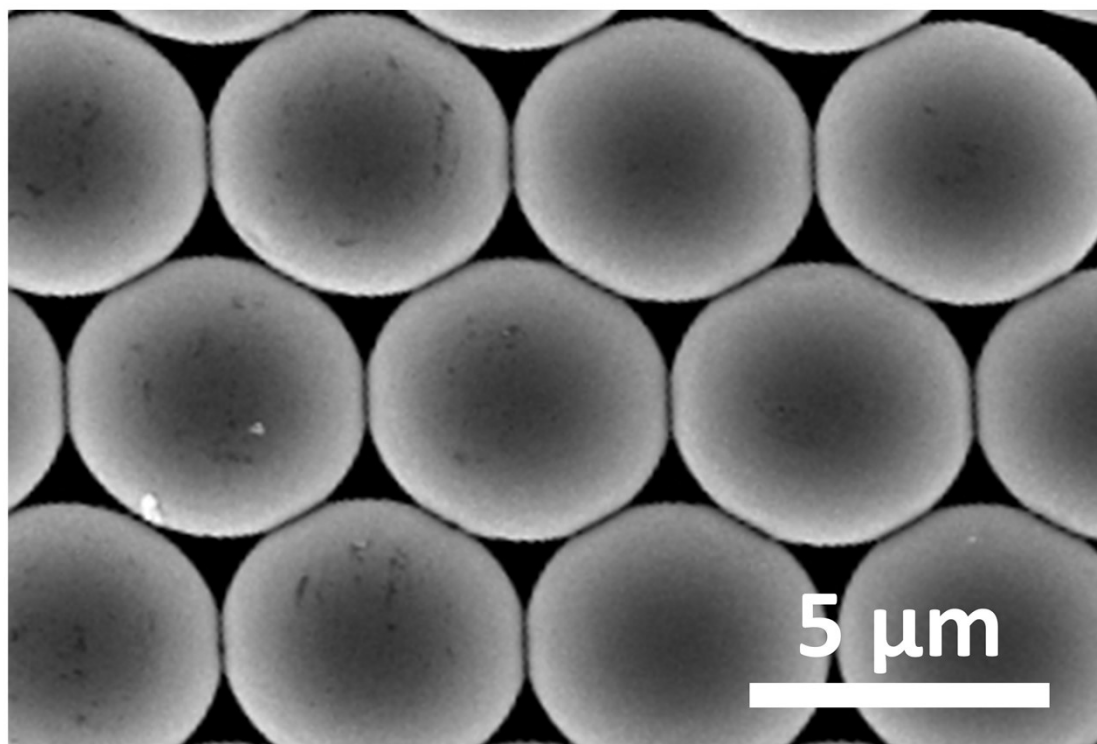


Fig. S1 SEM images of TiO<sub>2</sub>/ZnO microsphere arrays.

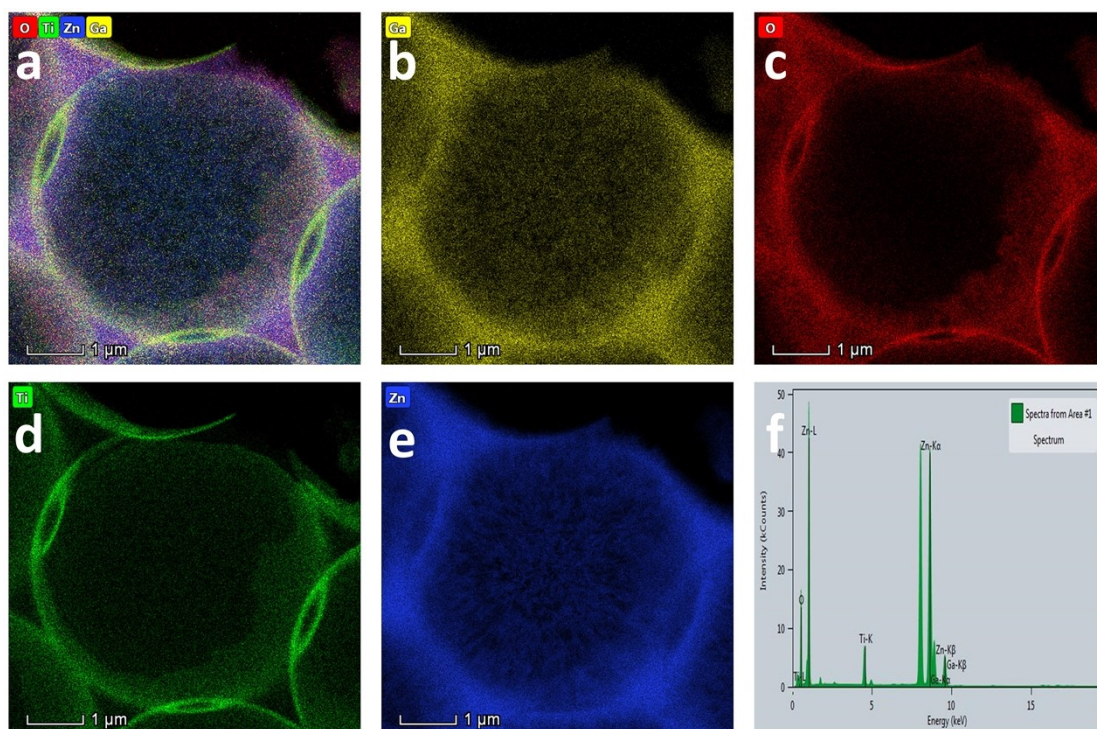


Fig. S2 TEM mapping of (a) overlapped images, (b) Ga, (c) O, (d) Ti and (e) Zn. (f) spectra from element mapping.

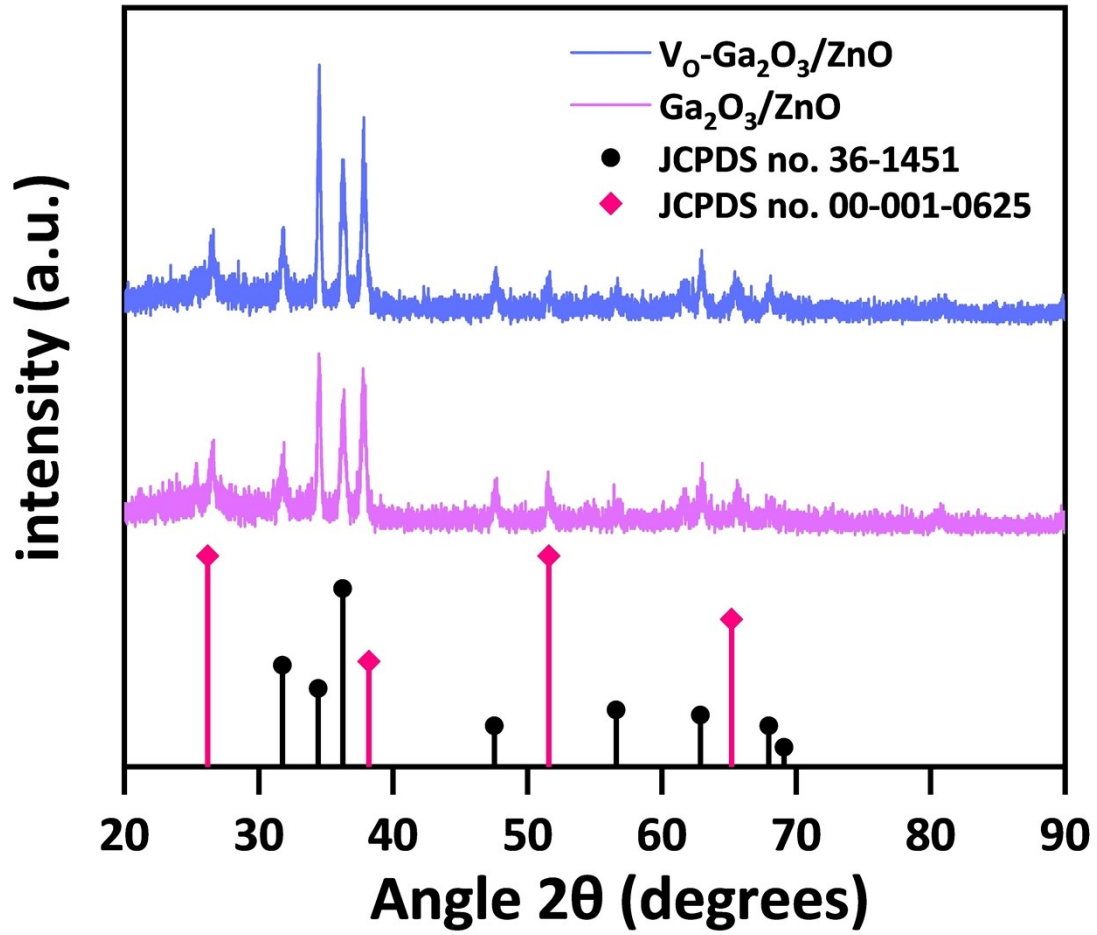


Fig. S3 XRD spectra of  $V_0$ - $Ga_2O_3/ZnO$  and  $Ga_2O_3/ZnO$ .

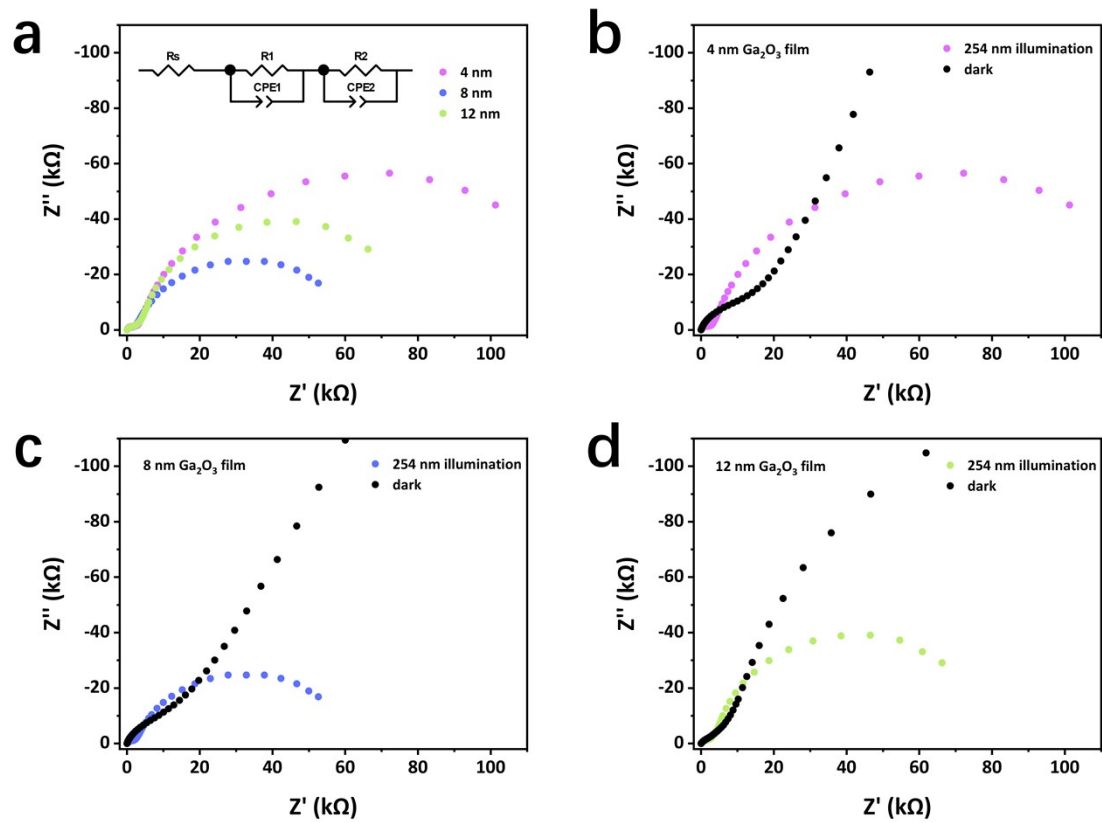


Fig. S4 EIS curves of (a) 3D  $V_0$ - $Ga_2O_3/ZnO$  with different thickness of  $Ga_2O_3$  film under 254 nm illumination. EIS curves of 3D  $V_0$ - $Ga_2O_3/ZnO$  with a  $Ga_2O_3$  film thickness of (b) 4 nm, (c) 8 nm, (d) 12 nm under 254 nm illumination and dark environment.

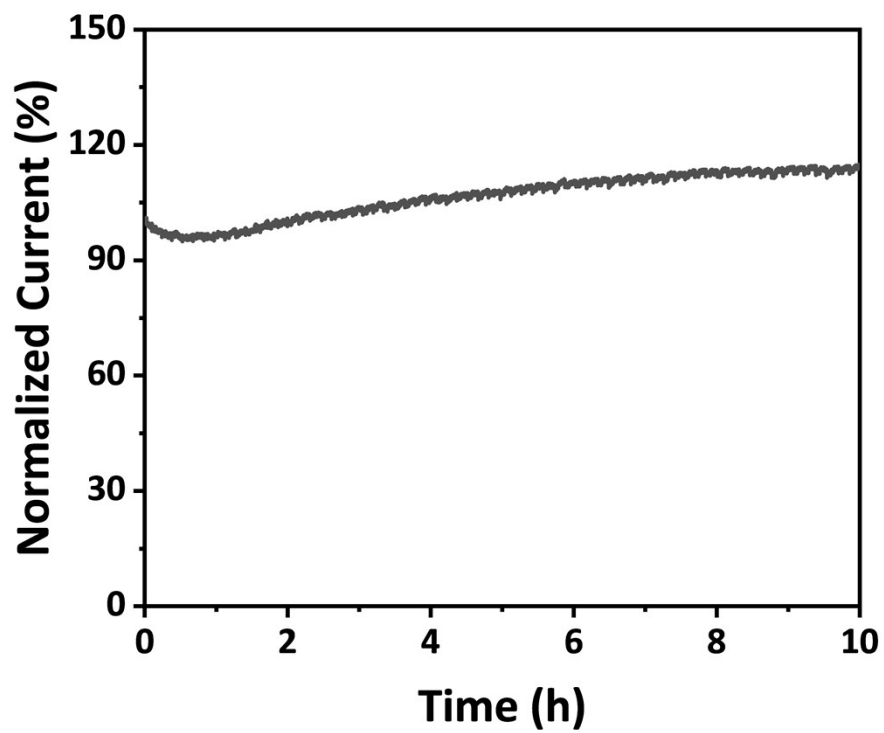


Fig. S5 Durability test of 3D V<sub>o</sub>-Ga<sub>2</sub>O<sub>3</sub>/ZnO under continuous light radiation at 254 nm.

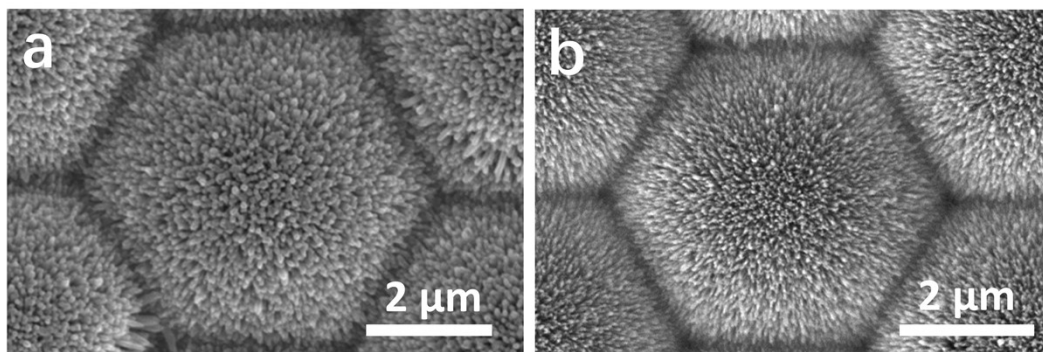


Fig. S6 SEM images of 3D V<sub>o</sub>-Ga<sub>2</sub>O<sub>3</sub>/ZnO (a) before and (b) after the durability test.

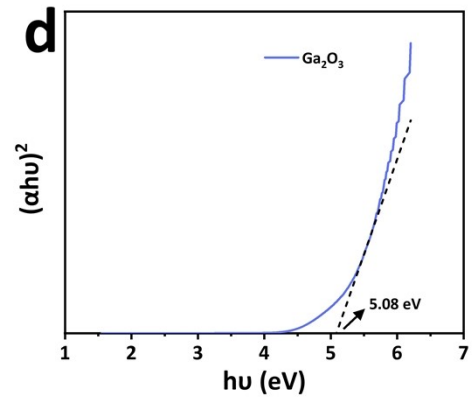
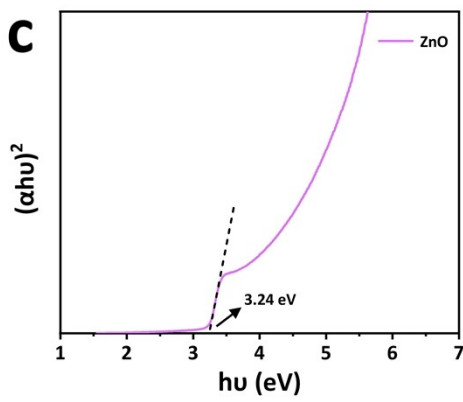
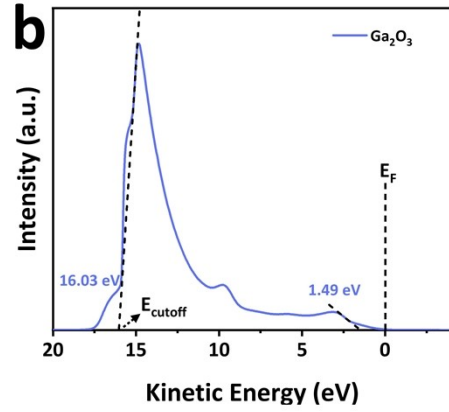
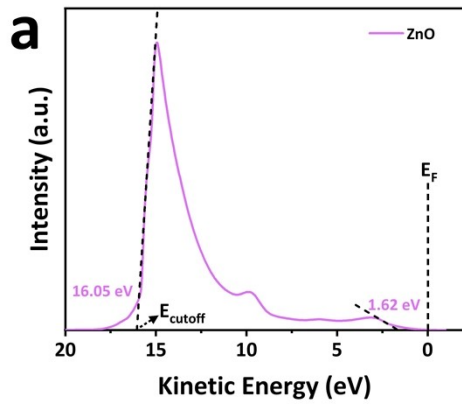


Fig. S7 UPS curves of (a) ZnO and (b)  $\text{Ga}_2\text{O}_3$ . Calculated band gaps of (c) ZnO and (d)  $\text{Ga}_2\text{O}_3$  from transmittance.