

Supplemental Information

Visible-light Photocatalytic Activity of S-doped α - Bi_2O_3

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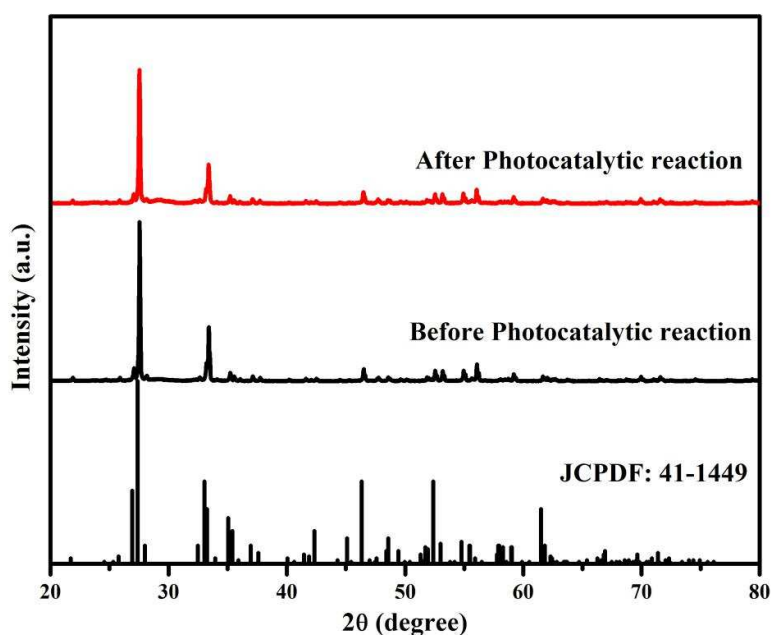


Figure S1 The XRD patterns of α - Bi_2O_3 S doped at 7 % before and after photocatalytic

reaction.

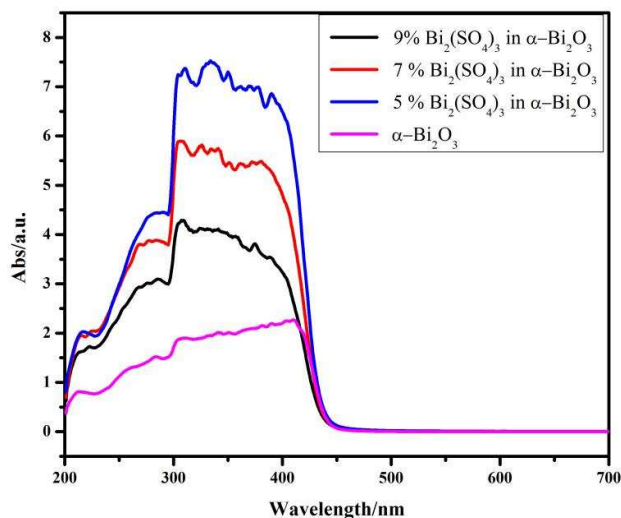


Figure S2 UV-Vis absorption spectra of compounds mixed with 5%, 7%, 9% $\text{Bi}_2(\text{SO}_4)_3$ and $\alpha\text{-Bi}_2\text{O}_3$.

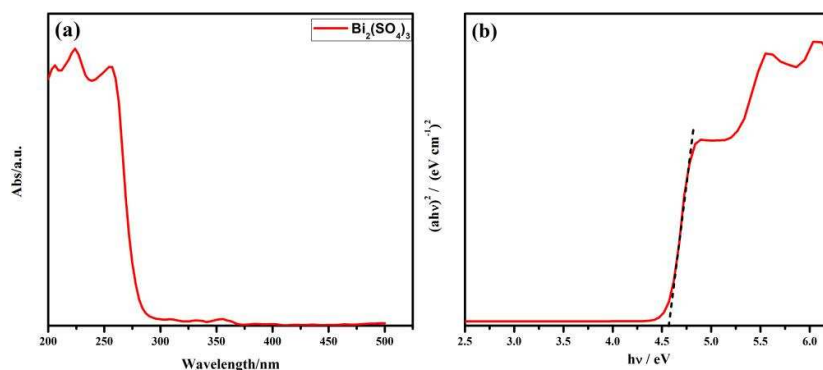


Figure S3 (a) UV-Vis absorption spectra and (b) Tauc plot of $\text{Bi}_2(\text{SO}_4)_3$.

The band gap of $\text{Bi}_2(\text{SO}_4)_3$ can be determined with the following Equation S1 below^{S1}.

$$\alpha h\nu = A(h\nu - E_g)^{\frac{n}{2}} \quad (\text{S1})$$

The α , ν , E_g , A , and n are the absorption coefficient, the incident light frequency, the band gap, a constant and an integer, respectively. The values of n and E_g were obtained as follows:

First, the approximate value of E_g was estimated through extrapolating the straight line to the wavelength axis (Fig. S2(a)), and then plotting $\ln(\alpha h\nu)$ vs. $\ln(h\nu - E_g)$ (inset of Fig. S2(a)). Thus, the slope of the straightest line near the band edge is the value of n .

Second, plot $(\alpha h\nu)^{2/n}$ vs. $h\nu$, and then evaluate the band gap E_g (4.57 eV) by drawing an extension line to the $h\nu$ axis intercept (Fig. S2(b)).

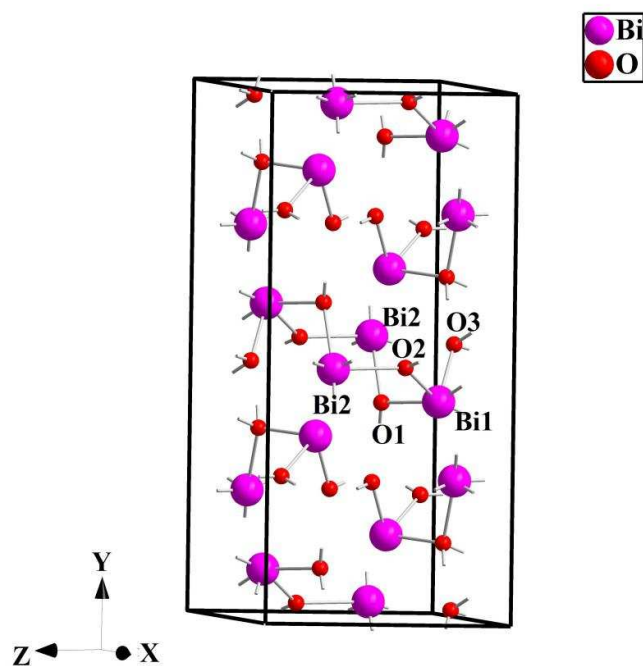


Figure S4 The crystal structure of α -Bi₂O₃ with marked asymmetric Bi and O sites.

Refence

(S1) Butler, M. A. Photoelectrolysis and Physics Properties of the Semiconducting Electrode WO₂. *J. Appl. Phys.* **1977**, 48, 1914-1920.