

Supplementary information for:

Preparation of novel Bi₉O_{7.5}S₆/SnS composite film with improved photoelectric properties

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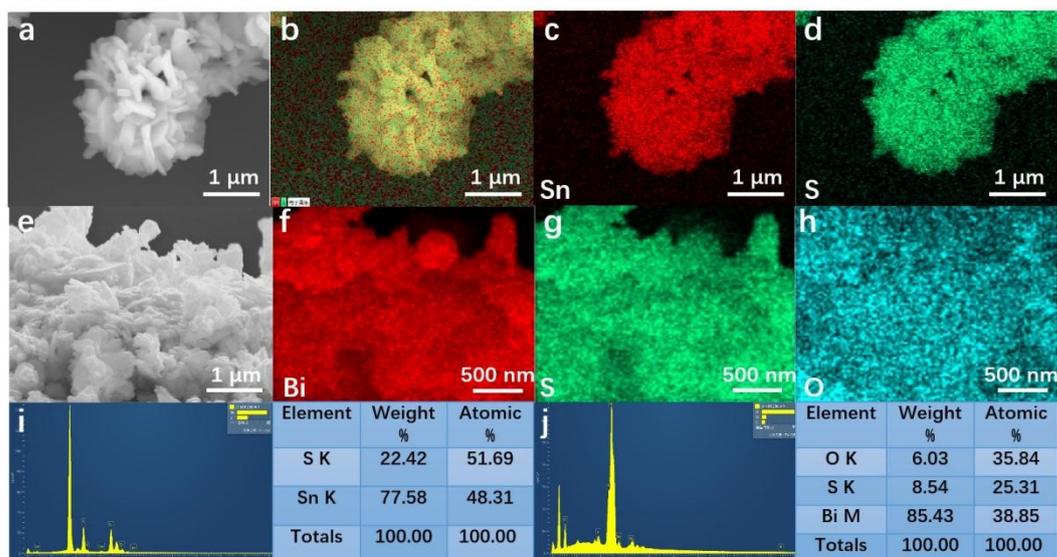


Figure S1. EDS mapping images of SnS (a-d) and Bi₉O_{7.5}S₆ (e-h) microcrystals. EDS result of SnS (i) and Bi₉O_{7.5}S₆ (j) microcrystals.

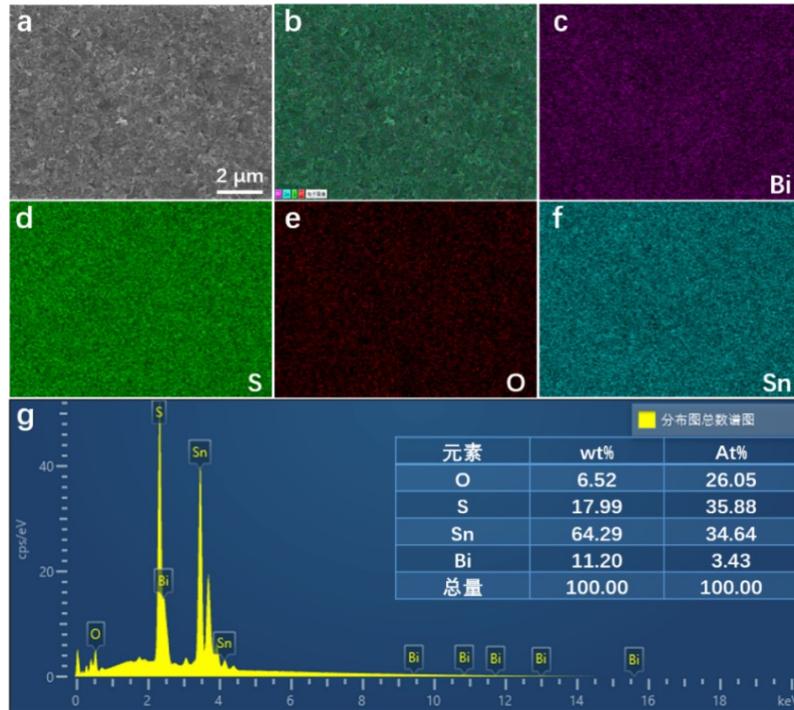


Figure S2. EDS mapping images (a-f) and corresponding EDS results (g) of the $\text{Bi}_9\text{O}_{7.5}\text{S}_6/\text{SnS}/\text{ITO}$ composite sample.

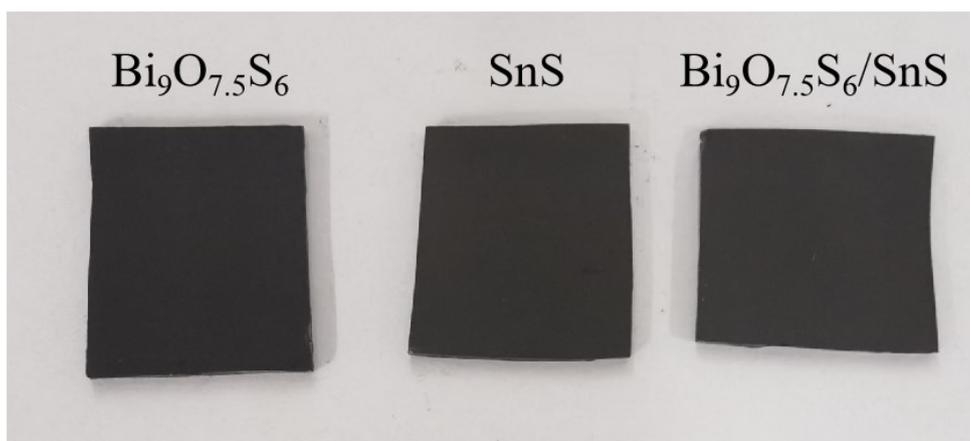


Figure S3. The optical photographs of $\text{Bi}_9\text{O}_{7.5}\text{S}_6$, SnS , and $\text{Bi}_9\text{O}_{7.5}\text{S}_6/\text{SnS}$ films.

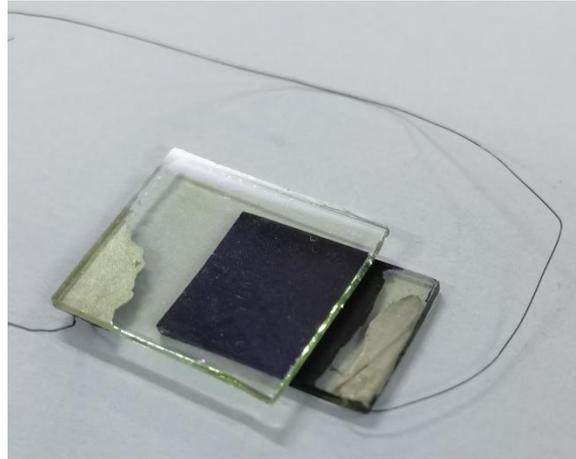


Figure S4. The physical appearance of the device.

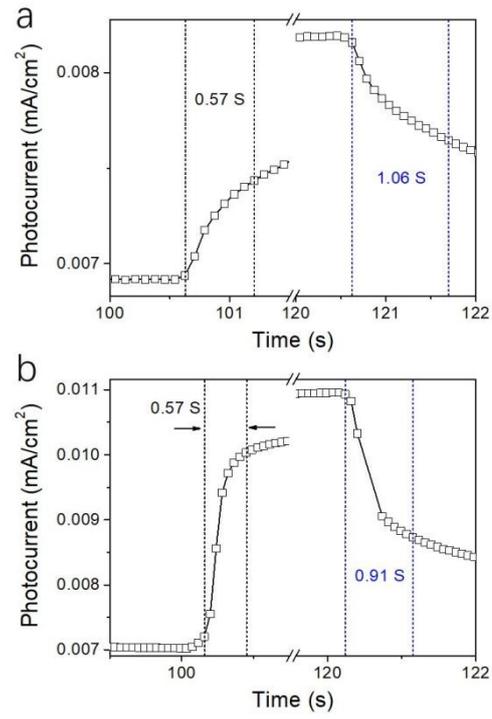


Figure S5. Response times of Bi₉O_{7.5}S₆ (a) and SnS (b) films at 1 V bias voltage.

Name of the sample	Photoresponsivity (mA/W)	Response time (s)	Optical bandgap (eV)	Ref.
Bi ₉ O _{7.5} S ₆ /SnS	40.1	0.49/0.74	1.2	This work
SnS/Si	86.2	0.15	1.0	29
SnS/WS ₂	719	5	-	30
SnS ₂ /SnS	35	0.9	-	31
SnS/CdS	10.4	1	1.1-2.4	32

Table S1. Comparison table of photodetection devices output performance.

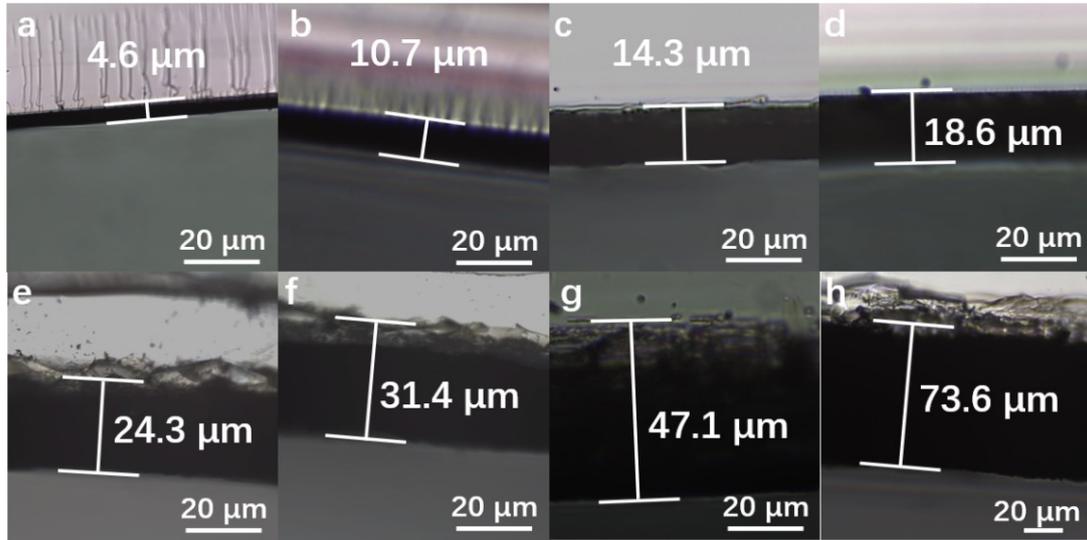


Figure S6. Cross-sectional optical micrographs of $\text{Bi}_9\text{O}_{7.5}\text{S}_6/\text{SnS}/\text{ITO}$ composite films with different thicknesses.

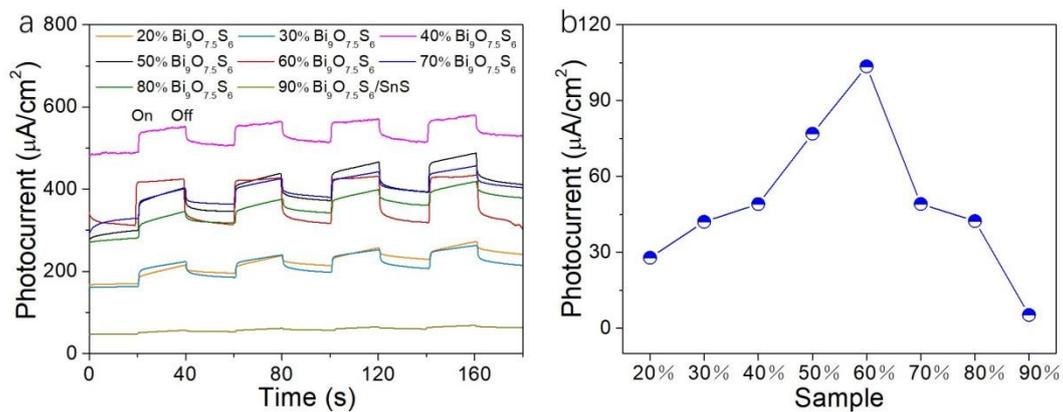


Figure S7. (a) J - t curves of $\text{Bi}_9\text{O}_{7.5}\text{S}_6/\text{SnS}/\text{ITO}$ devices with different ratios of $\text{Bi}_9\text{O}_{7.5}\text{S}_6/\text{SnS}$. (b) Corresponding photocurrent for different ratios of $\text{Bi}_9\text{O}_{7.5}\text{S}_6/\text{SnS}$.

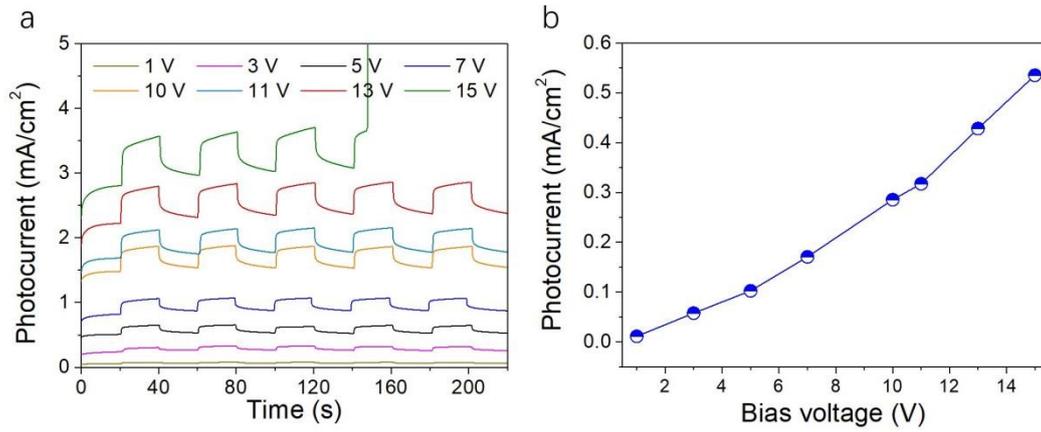


Figure S8. (a) The photocurrent curves of Bi₉O_{7.5}S₆/SnS/ITO film at different bias voltages. (b) Corresponding photocurrent density at different bias voltages.

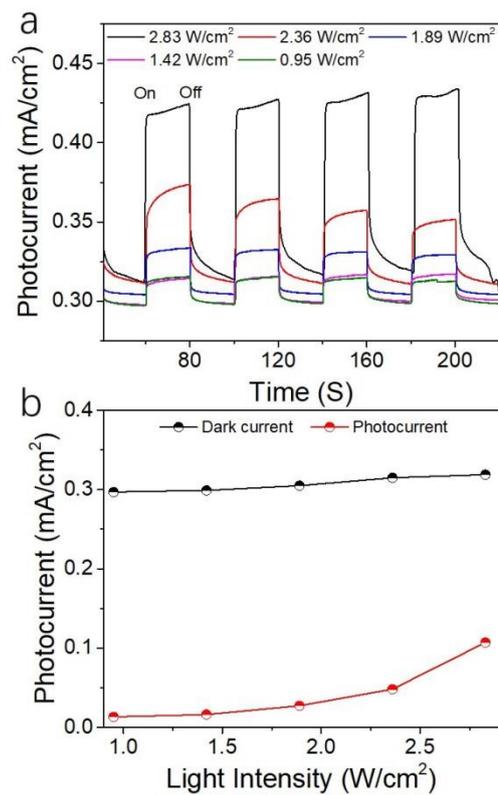


Figure S9. (a) $J-t$ curves of $\text{Bi}_9\text{O}_{7.5}\text{S}_6/\text{SnS}$ composite film versus the applied light intensity. (b) Photocurrent and dark current densities at different light intensities.

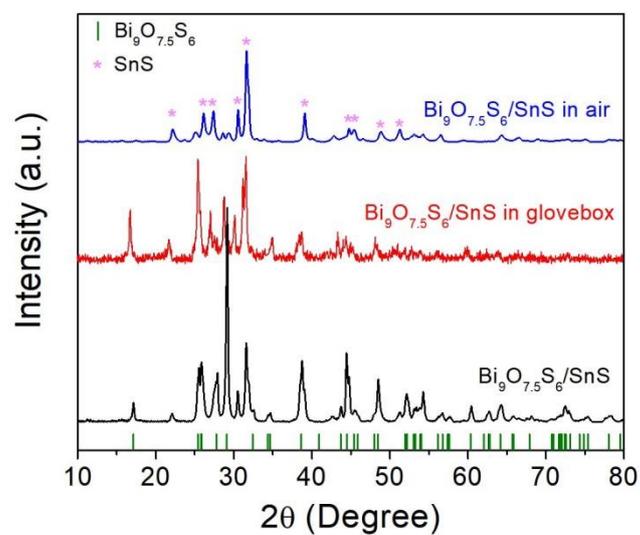


Figure S10. The XRD patterns of Bi₉O_{7.5}S₆/SnS composite films before and after exposing in air and glovebox for 2 weeks.

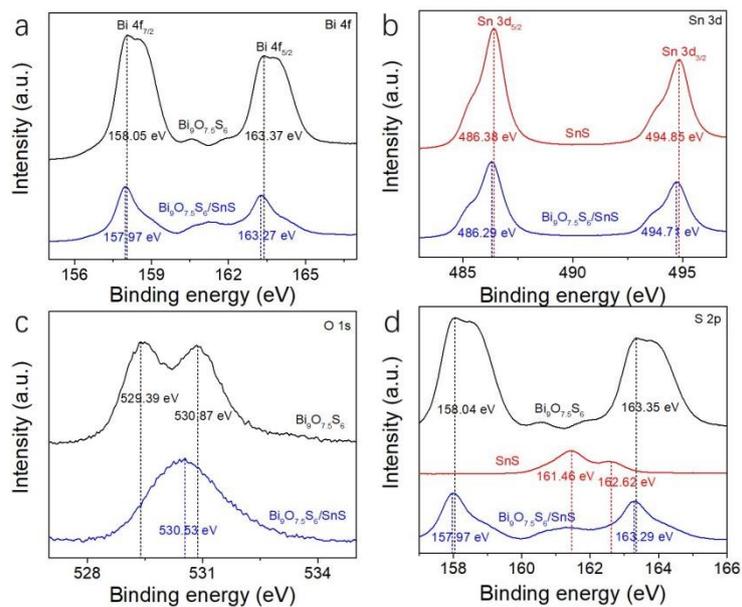


Figure S11. XPS spectra of Bi₉O_{7.5}S₆, SnS and Bi₉O_{7.5}S₆/SnS: (a) Bi 4f, (b) Sn 3d, (c) O 1s and (d) S 2p spectra.