

## Supporting Information

### Active site-exposed $\text{Bi}_2\text{WO}_6@\text{BiOCl}$ heterostructure for photocatalytic hydrogenation of nitroaromatic compounds

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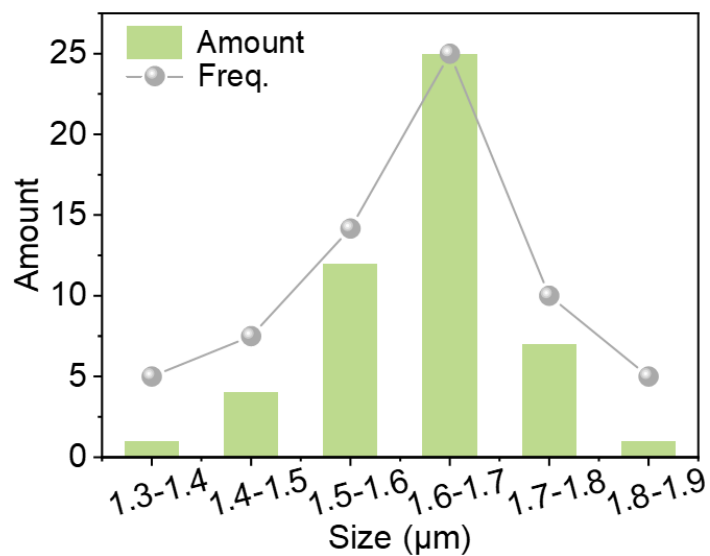
**Fig. S5.** SEM image of 10-BWO@BOC.

**Fig. S6.** UV-vis absorption spectra of 4-NA photocatalyzed by 10-BWO@BOC catalyst under UV-vis light irradiation using ammonium formate as a hole sacrificial agent.

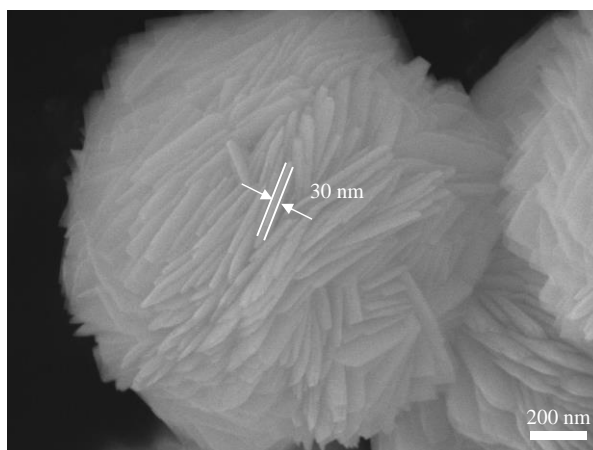
**Fig. S7.** (a) Decay curves of photovoltage and (b) electron lifetime of BOC, BWO, and 10-BWO@BOC composites.

**Fig. S8.** The 2D diagram of *in situ* DRIFTS spectra of the 10-BWO@BOC for the adsorption of a mixture of  $\text{H}_2\text{O}$  and 4-NA for 20 minutes in the dark and under UV-vis light irradiation for another 20 minutes.

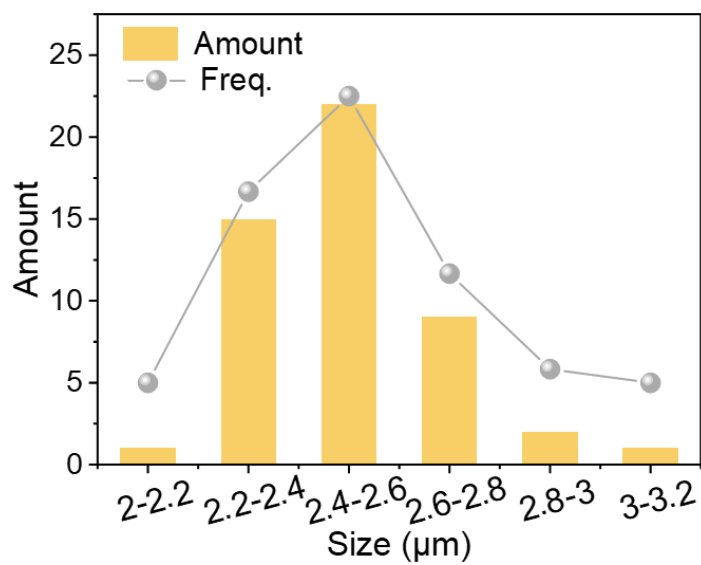
**Table S1.** TRPL decay lifetimes ( $\tau_1$ ,  $\tau_2$ ,  $\tau_3$ , and  $\tau_{\text{ave}}$ ) of the prepared samples.



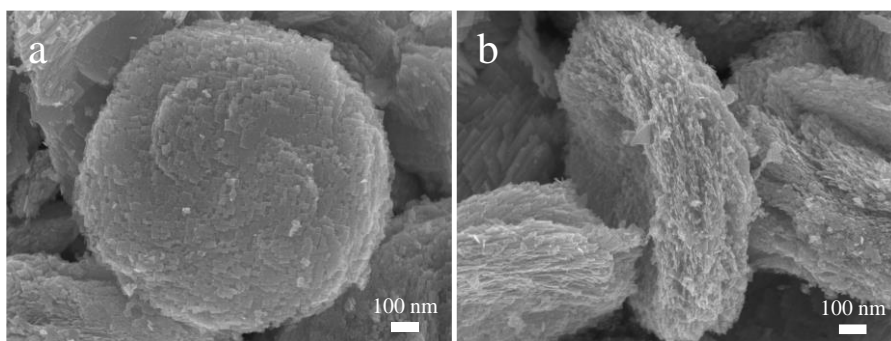
**Fig. S1.** Particle size distribution of BOC.



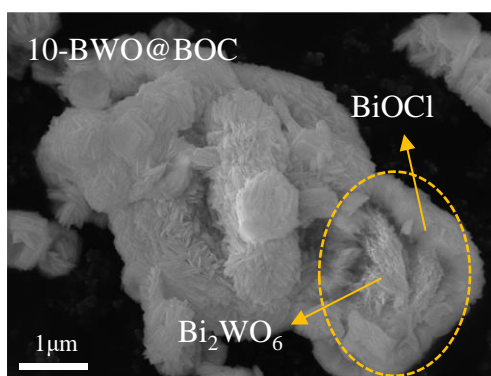
**Fig. S2.** SEM image of BOC.



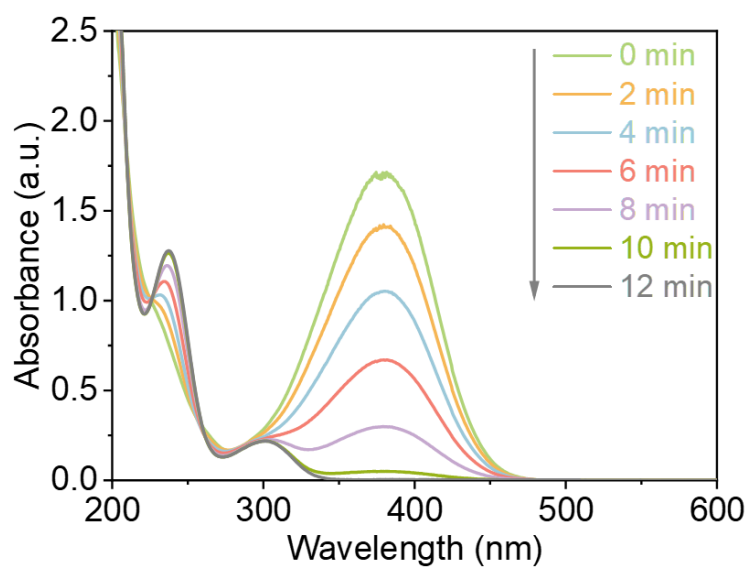
**Fig. S3.** Particle size distribution of BWO.



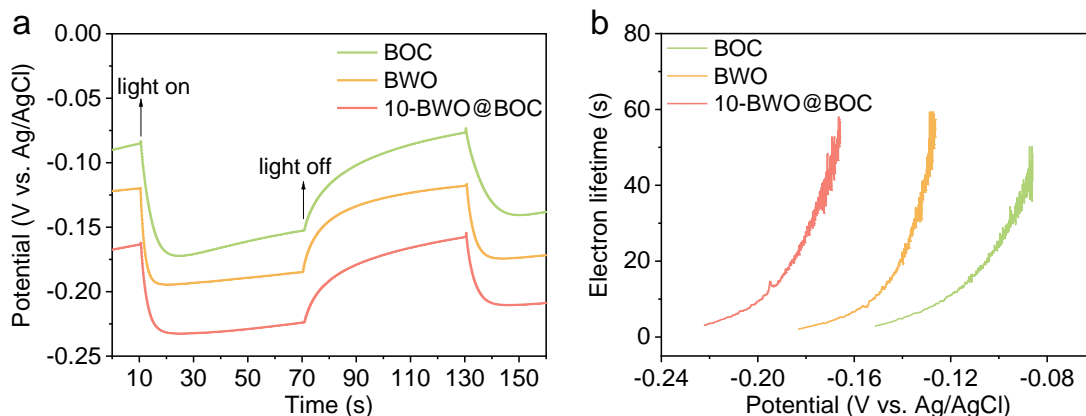
**Fig. S4.** SEM images of BWO.



**Fig. S5.** SEM image of 10-BWO@BOC.



**Fig. S6.** UV-vis absorption spectra of 4-NA photocatalyzed by 10-BWO@BOC catalyst under UV-vis light irradiation using ammonium formate as a hole sacrificial agent.

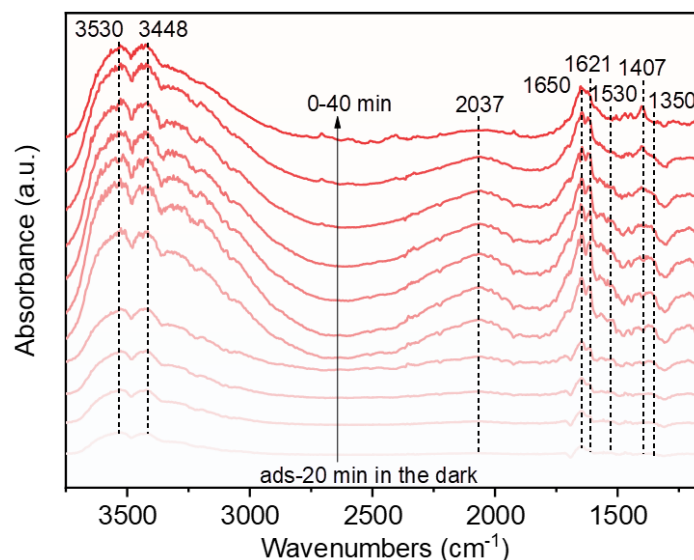


**Fig. S7.** (a) Decay curves of photovoltage and (b) electron lifetime of BOC, BWO, and 10-BWO@BOC composites.

**Supplementary Note:** The electron lifetime in **Fig. S7b** is counted according to the following formula:<sup>1</sup>

$$\tau_n = (k_B T / e) * (dV_{OC} / dt)^{-1}$$

where  $\tau_n$  is the electron lifetime,  $k_B$  is the Boltzmann constant ( $1.3806 \times 10^{-23}$  J/K),  $T$  is the temperature (298.15 K),  $e$  is the charge of one electron ( $1.602 \times 10^{-19}$  C), and  $V_{OC}$  is the open circuit voltage at time  $t$  (**Fig. S7a**).



**Fig. S8.** The 2D diagram of *in situ* DRIFTS spectra of the 10-BWO@BOC for the adsorption of a mixture of  $H_2O$  and 4-NA for 20 minutes in the dark and under UV-vis light irradiation for another 20 minutes.

**Table S1.** TRPL decay lifetimes ( $\tau_1$ ,  $\tau_2$ ,  $\tau_3$ , and  $\tau_{ave}$ ) of the prepared samples.

Sample	$\tau_1$ (ns)	T <sub>1</sub> ration (%)	$\tau_2$ (ns)	T <sub>2</sub> ration (%)	$\tau_3$ (ns)	T <sub>3</sub> ration (%)	$\tau_{ave}$ (ns)
BWO	1.04	75.27	3.25	11.76	17.87	12.98	3.48
BOC	0.75	26.27	3.13	49.07	14.94	24.26	5.38
5- BWO@BOC	0.67	33.06	2.80	43	20.00	23.94	6.21
10- BWO@BOC	0.70	39.14	2.88	37.79	21.37	23.07	6.29
15- BWO@BOC	0.71	37.23	2.49	38.42	19.66	24.35	6.01

The lifetimes ( $\tau_1$ ,  $\tau_2$ , and  $\tau_3$ ) were acquired by fitting the TRPL decay spectra, obtained with an excitation wavelength of 370 nm, of prepared samples using a tri-exponential function of  $I(t) = \sum T_i \exp(-t/\tau_i)$  ( $i = 1, 2$ , and  $3$ ). The average lifetime constants ( $\tau_{ave}$ ) were counted using the formula of  $\tau_{ave} = \frac{\tau_1 * T_1}{(T_1 + T_2 + T_3)} + \frac{\tau_2 * T_2}{(T_1 + T_2 + T_3)} + \frac{\tau_3 * T_3}{(T_1 + T_2 + T_3)}$ .

- 1 Rabell, G. O.; Alfaro Cruz, M. R.; Juárez-Ramírez, I. *Int. J. Hydrogen Energy*, 2022, **47**, 7770-7782.
- 2 Zhang, S.; Yuan, Y.; Gu, J.; Huang, X.; Li, P.; Yin, K.; Xiao, Z.; Wang, D. *Appl. Surf. Sci.*, 2023, **609**, 155446.