Supplementary Materials

Fabrication of $CuO/BiVO_4$ composites for enhanced visible-light-driven photocatalytic antibacterial activity

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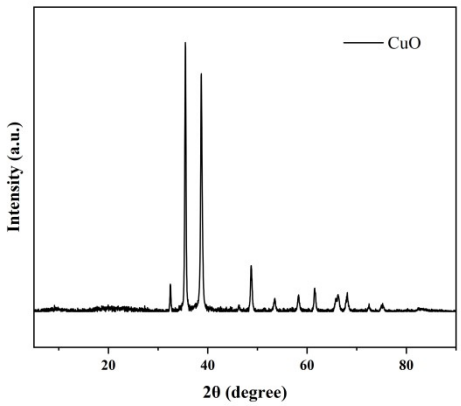

Figure S1. XRD pattern of CuO

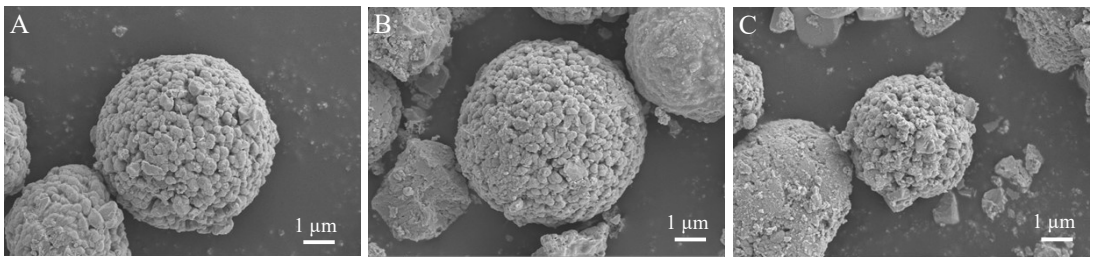

Figure S2. SEM images of $CuO/BiVO_4$ composite materials (A: $CuO/BiVO_4$-10%; B: $CuO/BiVO_4$-16.7%; C: $CuO/BiVO_4$-20%)

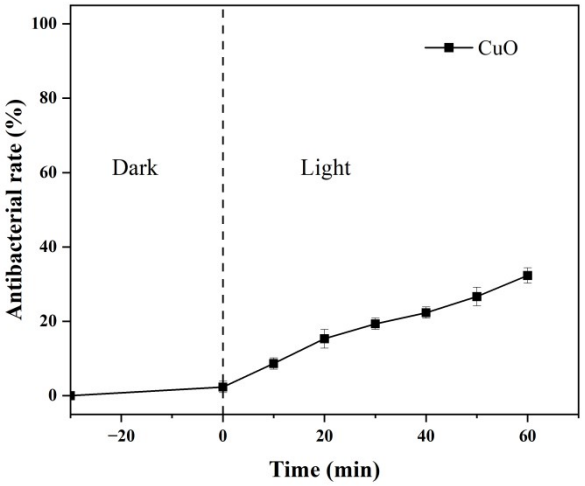

Figure S3. Antibacterial performance of CuO

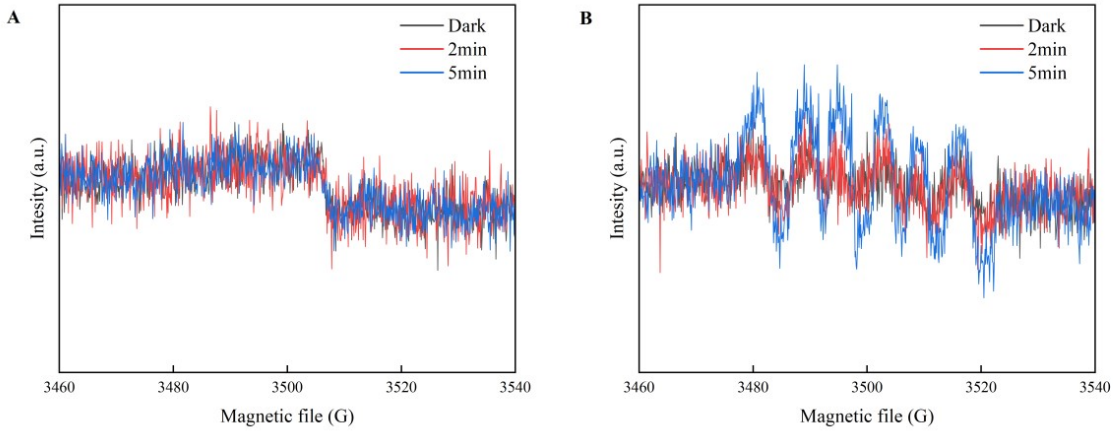

Figure S4. EPR spectra of $\cdot O_2^-$ produced by (A) $BiVO_4$ and (B) $CuO/BiVO_4$

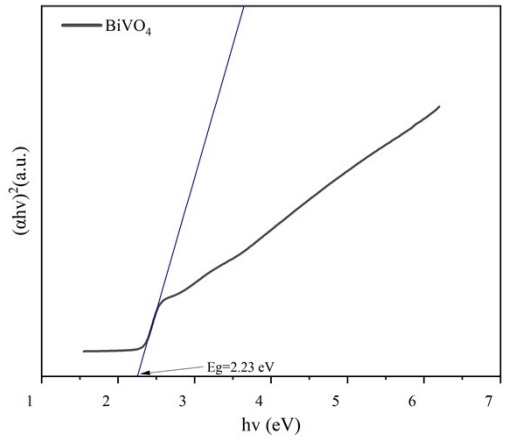

Figure S5. UV-Vis spectrum of $BiVO_4$: relationship between $(\alpha hv)^2$ and hv

Based on the literature, the band gap of CuO was 1.7 eV, with the VB potential of 2.16 eV and CB potential of 0.46 eV[1].

Based on the UV–vis DRS results, the band gap value of $BiVO_4$ was calculated by Equation (1), and a Tauc plot was constructed.

$$(\alpha hv)^n = A(hv - Eg) \quad (1)$$

Where A, Eg, α, h, and v denote the constant, band gap energy, absorption coefficient, Planck constant, and optical frequency, respectively. The value of n depends on the type of electronic transition in the semiconductor: n=2 for semiconductors with direct allowed transitions and n=1/2 for those with indirect allowed transitions. Since $BiVO_4$ is a semiconductor with direct allowed electronic transitions, Eg can be derived from the intercept of the $(\alpha hv)^2$ curve on the x-axis. It can be seen from Figure S5 that the Eg value of $BiVO_4$ is 2.23 eV. The conduction band edge (E_{CB}) and valence band edge (E_{VB}) of a semiconductor can be calculated using the Equations (2-3)[2].

$$E_{CB}=X-E_C-1/2Eg \quad (2)$$

$$E_{VB}=E_{CB}+Eg \quad (3)$$

Where X is the absolute electronegativity of the atom semiconductor; E_C is the energy of free electrons of the hydrogen scale (4.5 eV); Eg is the band gap of semiconductor; and E_{VB} is the VB edge potential and the E_{CB} is the CB edge potential.

It can be calculated that the valence band edge (E_{VB}) of $BiVO_4$ is 2.65 eV and the conduction band edge (E_{CB}) of $BiVO_4$ is 0.42 eV.

Table S1 Antibacterial performance of $BiVO_4$ based nanomaterials

Materials	Preparation method	Concentration (μg/mL)	*E. coli* (CFU/mL)	Antibacterial rate	Ref.
$V_2O_5/BiVO_4$	Precipitation	1000	10^8	99%	[3]
$BiO_4/Bi_2WO_6/WO_3$	Hydrothermal	1000	10^6	100%	[4]
$BiVO_4$/g-C_3N_4	In situ solid-state	800	10^7	99%	[5]
$Ag/BiVO_4$	Hydrothermal	1200	10^6	100%	[6]
Fe-doped $BiVO_4$	Sol-Gel	1000	10^6	100%	[7]
Biochar/$BiVO_4$	Impregnation-calcination	900	10^6	99.5%	[8]
AgI/$BiVO_4$	Precipitation-photor eduction	1000	10^6	99.88%	[9]
CuO/$BiVO_4$	Impregnation-calcination	1000	10^6	100%	This work

Table S2 Slope and R^2 value of dynamic fitting curve

	$BiVO_4$	CuO/$BiVO_4$-10%	CuO/$BiVO_4$-12.5%	CuO/$BiVO_4$-16.7%	CuO/$BiVO_4$-20%
k (min^{-1})	0.00057	0.004	0.00435	0.00306	0.00257
R^2	0.96604	0.99618	0.93699	0.99508	0.98899

References

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