

## Supporting Information

### **Type I Bi<sub>2</sub>S<sub>3</sub>@ZnS Core-shell Structured Photocatalyst for the Selective Photoelectrochemical Sensing of Cu<sup>2+</sup>**

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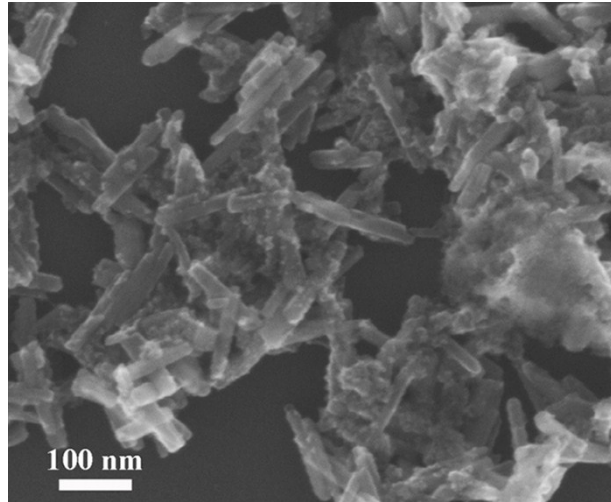


Fig. S1. SEM image of Bi<sub>2</sub>S<sub>3</sub>@ZnS prepared without CA.

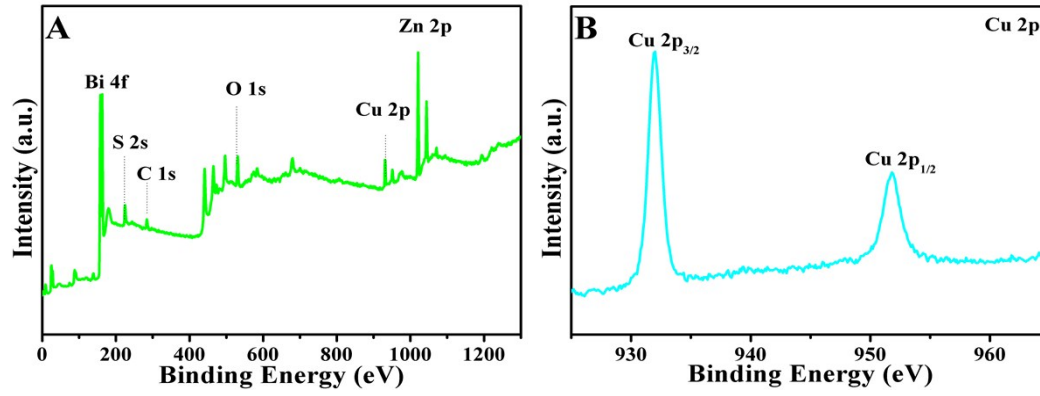


Fig. S2. XPS spectrum (A) of  $\text{Bi}_2\text{S}_3@\text{ZnS}$  composite after added  $\text{Cu}^{2+}$  to the solution. High-resolution XPS spectrum (B) of Cu 2p in  $\text{Bi}_2\text{S}_3@\text{ZnS}$  composite after added  $\text{Cu}^{2+}$  to the solution.

Table S1. EDX data of Bi<sub>2</sub>S<sub>3</sub>@ZnS composite.

Element	Wt%	At%
S K	18.32	53.15
Zn K	10.73	15.27
Bi M	70.95	31.58

Table S2. Pearson absolute electronegativity (PAE) of constituent atoms of the photocatalyst Bi<sub>2</sub>S<sub>3</sub>@ZnS.

	Bi	S	Zn
PAE (eV)	4.69	6.22	4.45

Table S3 Energy band structure parameters of Bi<sub>2</sub>S<sub>3</sub> and ZnS photocatalysts.

Semiconductors	Electronegativity ( <i>X</i> )	Estimated <i>E<sub>g</sub></i> (eV)	Calculated <i>E<sub>CB</sub></i> (eV)	Calculated <i>E<sub>VB</sub></i> (eV)
Bi <sub>2</sub> S <sub>3</sub>	5.56	1.38	0.37	1.75
ZnS	5.26	3.44	-0.96	2.48

Table S4. Comparison of various PEC sensors for Cu<sup>2+</sup> detection.

PEC sensors	Linear range (μM)	LOD (μM)	Ref.
SnO <sub>2</sub> /CdS	1.0-38.0	0.55	s <sup>1</sup>
CdS Nps-Au QDs	0.0005-0.12	0.00673	s <sup>2</sup>
CdZnS	0.01-100	0.003	s <sup>3</sup>
Au/ZnS Nps	0.001 – 1.0	0.0005	s <sup>4</sup>
CdxZn <sub>1-x</sub> S-rGO	0.02-20	0.067	s <sup>5</sup>
Bi <sub>2</sub> S <sub>3</sub> @ZnS	0.003-30	0.001	This work

## References

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