Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.
This journal is © The Royal Society of Chemistry 2017

Supporting Information

Electrostatic Interaction Mechanism Based Synthesis of Z-Scheme BiOI-CdS Photocatalyst for Selective and Sensitive Detection of Cu^{2+}

Hao Wang, Huili Ye, Bihong Zhang, Faqiong Zhao* and Baizhao Zeng*

Key Laboratory of Analytical Chemistry for Biology and Medicine (Ministry of Education), College of Chemistry and Molecular Sciences, Wuhan University, Wuhan 430072, Hubei Province, P. R. China

Corresponding Author:

* Tel: 86-27-68752701; Fax: 86-27-68754067;

*E-mail address: fqzhao@whu.edu.cn, bzzeng@whu.edu.cn

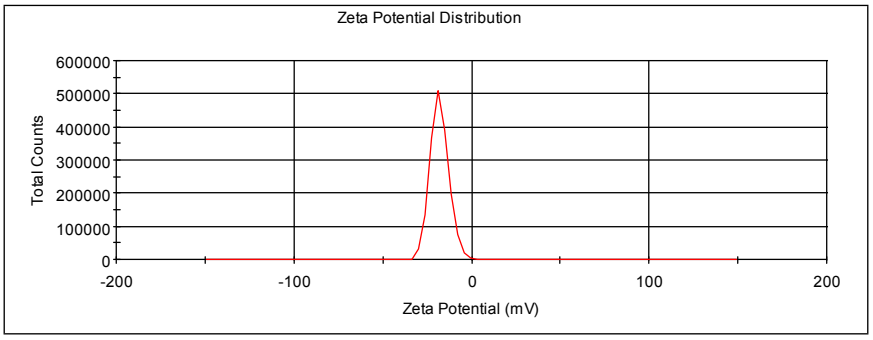


Figure S1. The Zeta potential of the as-synthesized BiOI dispersed in aqueous solution at room temperature.

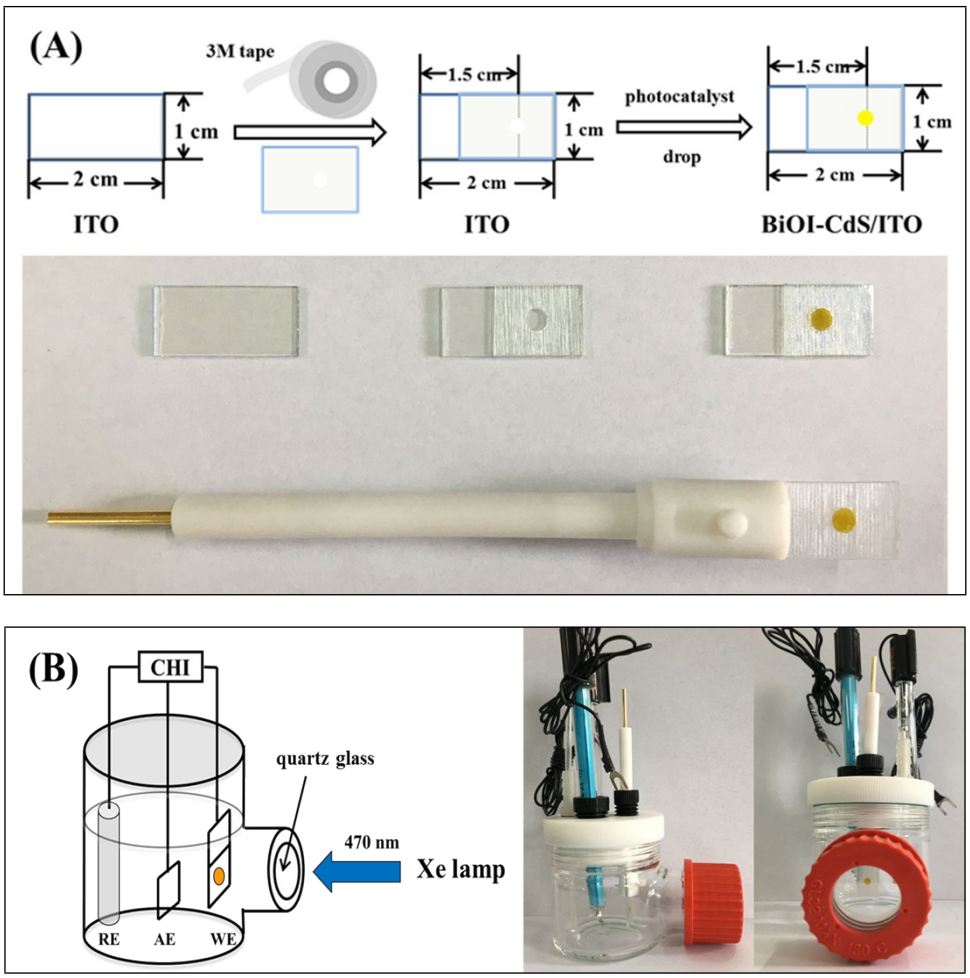
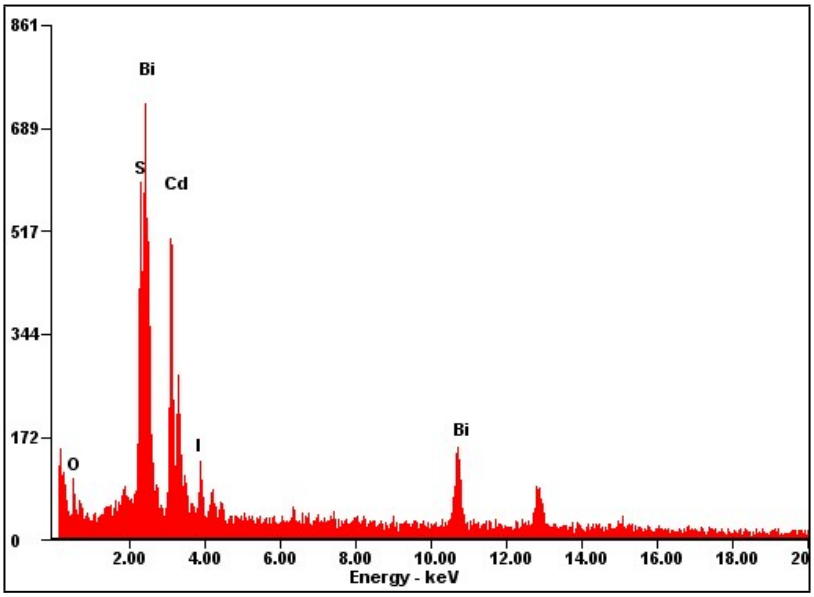


Figure S2. (A) Step-wise procedure for electrode fabrication using an ITO substrate.

(B) The device for photoelectrochemical detection.



Element	*Wt%*	*At%*
O K	07.13	34.06
S K	09.63	22.95
Cd L	33.85	23.02
I L	08.10	04.88
Bi L	41.28	15.10

Figure S3. EDS of BiOI-CdS-3 composite.

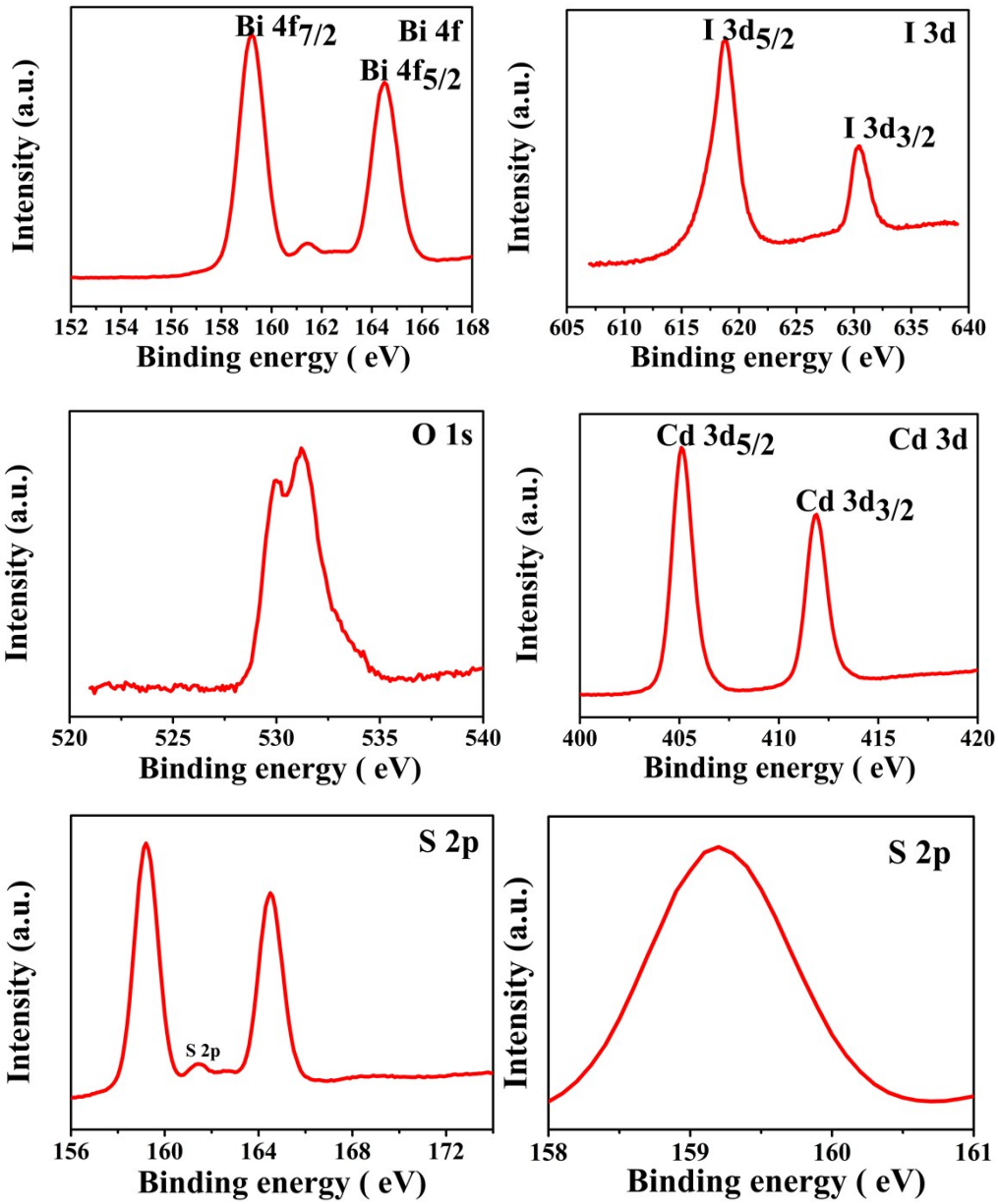


Figure S4. Comparison of high-resolution XPS spectra of Cd 3d, Bi 4f, I 3d, O 1s, S 2p for the BiOI-CdS-3 sample.

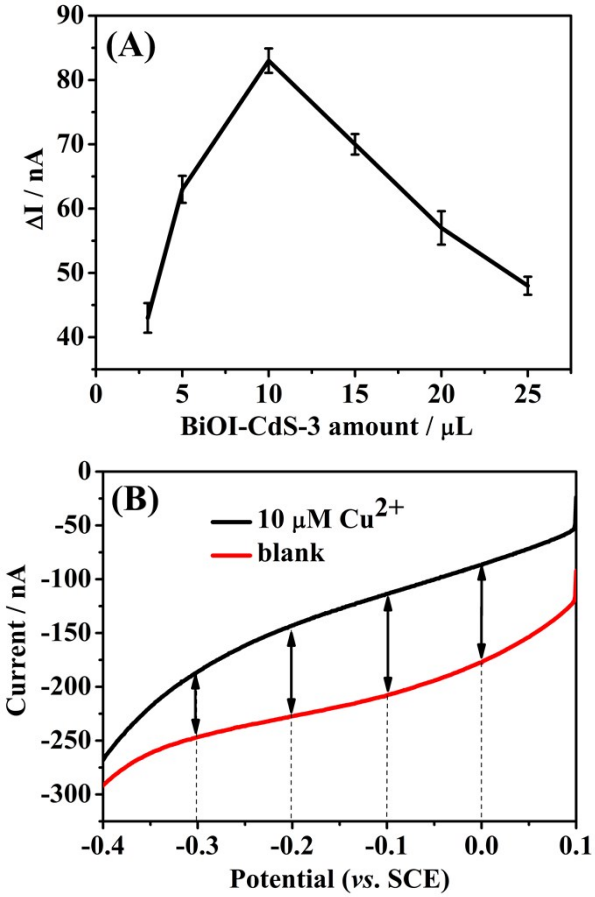


Figure S5. (A) Influence of BiOI-CdS-3 amount (1 mg/mL) on the photocurrent response of PEC sensor to 10 μM Cu^{2+}; (B) *I-V* curve of BiOI-CdS-3/ITO under illumination in 0.1 M Na_2SO_4 in the presence and absence of 10 μM Cu^{2+}.

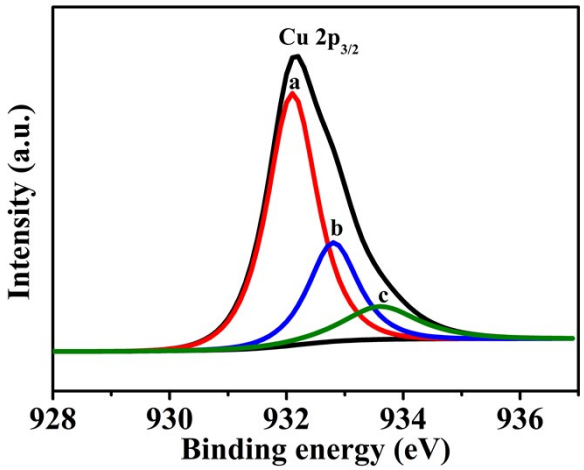


Figure S6. XPS spectra of Cu 2p after the reaction of Cu^{2+} with BiOI-CdS-3 under 470 nm light irradiation. The binding energy corresponding to the three sub-peaks of Cu $2p_{3/2}$ (at 932.1 (a), 932.8 (b), and 933.6 (c) eV, respectively).

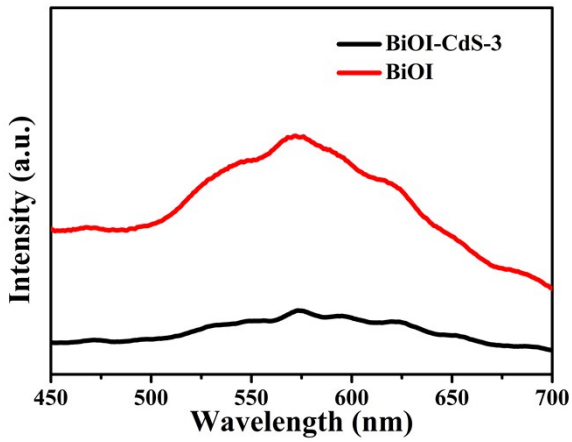


Figure S7. PL spectra of BiOI, BiOI-CdS-3 recorded at excitation wavelength of 380 nm.

Table S1. (a) Pearson absolute electronegativity (PAE) of constituent atoms of the photocatalysts.

	Cd	S	Bi	O	I
PAE	4.33 eV	6.22 eV	4.69 eV	7.54 eV	6.76 eV

(b) Energy band structure parameters of BiOI and CdS photocatalysts.

Semiconductors	Electronegativity (X)	Estimated E_g (eV)	Calculated E_{VB} (eV)	Calculated E_{CB} (eV)
CdS	5.19	2.17	1.78	−0.40
BiOI	6.21	1.91	2.67	0.76

Table S2. Detection of Cu^{2+} ions in drinking water sample.

Sample	Added (μM)	Founded (μM)	Recovery (%)
Drinking water	0.00	0.95	
	1.00	2.04	109
	10.00	10.54	95.9

Table S3. Comparison of various Cu^{2+} ion sensor based on different detection methods.

Detection method	Linear range (μM)	LOD (μM)	Ref.
Differential pulse voltammetry	9.44 – 157.37	1.57	S1
Voltammetry	0.075 – 2.5	0.031	S2
Electrochemiluminescence	0.1 – 10	0.02	S3
Photoelectrochemical sensor	0.001 – 1.0	0.0005	S4
Photoelectrochemical sensor	0.02 – 20	0.067	S5
Photoelectrochemical sensor	1.0 – 38.0	0.55	S6
Photoelectrochemical sensor	0.1 – 100	0.02	This work

Reference

S1 J. Kudr, H. V. Nguyen, J. Gumulec, L. Nejdl, I. Blazkova, B. R. Nedecky, D. Hynek, J. Kynicky, V. Adam and R. Kizek, *Sensors*, 2014, **15**, 592-610.

S2 R. Takeuchi, A. Santos, P. Padilha and N. Stradiotto, *Talanta*, 2007, **71**, 771-777.

S3 J. Wang and X. C. Jiang, *Sens. Actuators, B*, 2015, **207**, 552-555.

S4 H. Xu, D. D. Huang, Y. Wu and J. W. Di, *Sens. Actuators, B*, 2016, **235**, 432-438.

S5 J. J. Yan, K. Wang, Q. Liu, J. Qian, X. Y. Dong, W. Liu and B. J. Qiu, *RSC Adv.*, 2013, **3**, 14451-14457.

S6 F. L. Huang, F. Pu, X. Q. Lu, H. F. Zhang, Y. Xia, W. Huang and Z. L. Li, *Sens. Actuators, B*, 2013, **183**, 601-607.