Supporting Information

Ni-doped CuS as an Efficient Electrocatalyst for Oxygen Evolution Reaction

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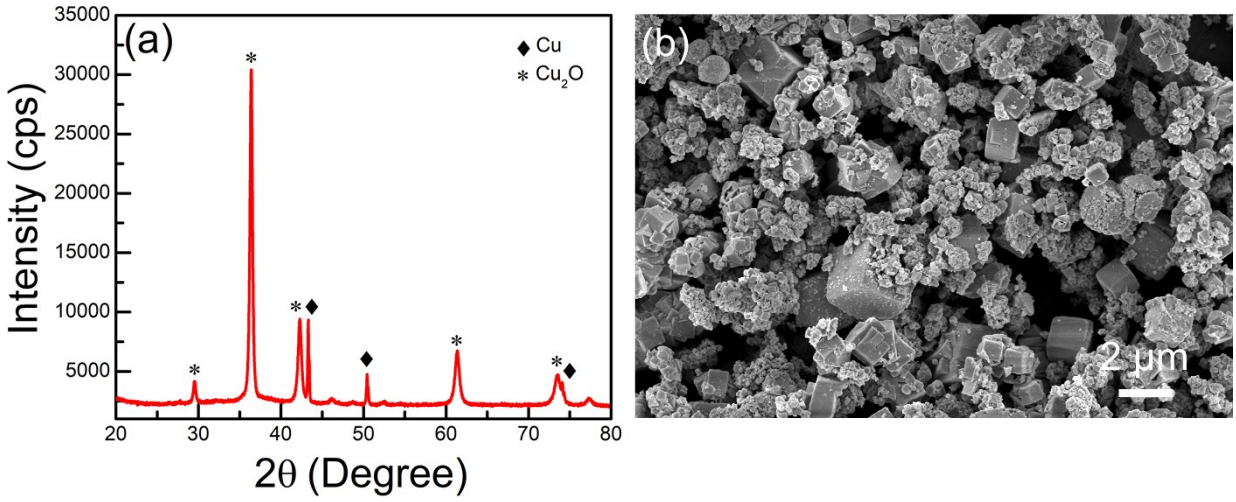

Figure S1. (a) XRD pattern and (b) FESEM image of sample prepared with without ethylenediamine.

Table S1. Comparison on the OER performance of reported electrocatalysts

Catalyst	Electrolyte	Enhancer	Overpotential (V) @10 mA/cm^2	Tafel slope (mV/dec)	Ref
Cu_2S NPs	250 mM phosphate buffer, pH = 13	Glycin	0.428	63	1
CuS NPs	250 mM phosphate buffer, pH = 13	Glycin	0.586	82	1
Cu_2S NPs	0.25 M phosphate buffer (pH = 13)	-	0.401	52	2
Co−doped Cu_7S_4	1 M KOH	-	0.270	130	3
Cu_2S nanosheets	1.0 M KOH	-	0.336@20 mA/cm^2	101	4
$CuS_{0.55}$ hollow NPs	1.0 M KOH	-	0.386@100 mA/cm^2	33	5
CuS Nanosheets	1.0 M KOH	-	0.408	130	6
Co_9S_8-CuS-FeS	1.0 M KOH	-	0.30	79	7
CuS/NiS_2	0.1 M KOH	-	0.29	36	8
3% Ni-doped CuS	0.5 M KOH	-	0.39	96.8	This work

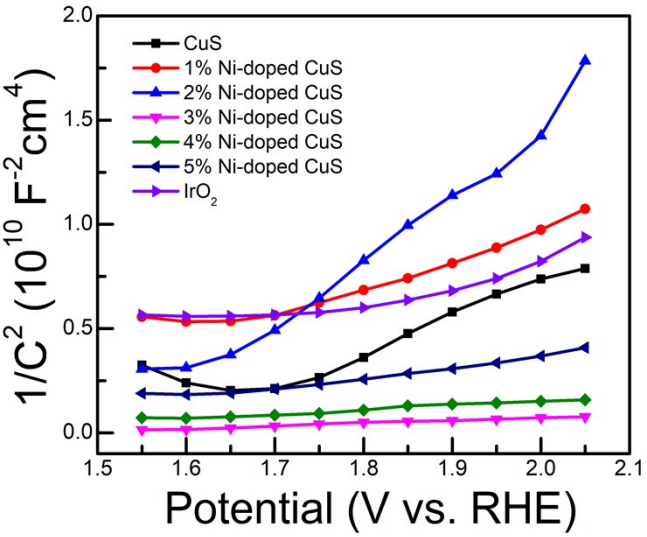

Figure S2. Mott−Schottky plots of pristine CuS, Ni-doped CuS, and IrO_2in 0.5(M) KOH at 1000 Hz.

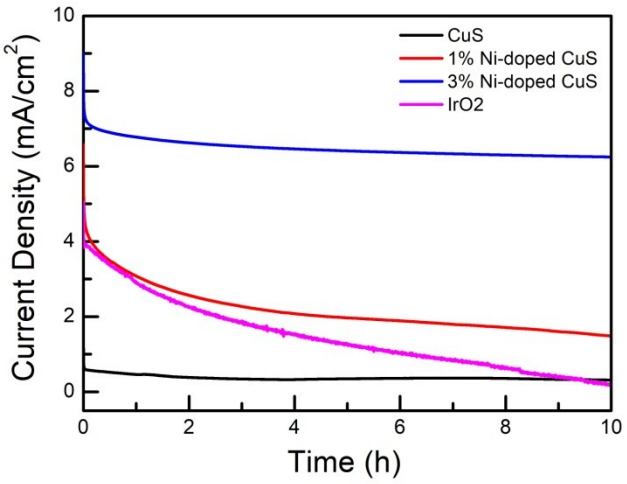

Figure S3. Chronopotentiometry plot of CuS, 1% Ni-doped CuS, 3% Ni-doped CuS and IrO_2.

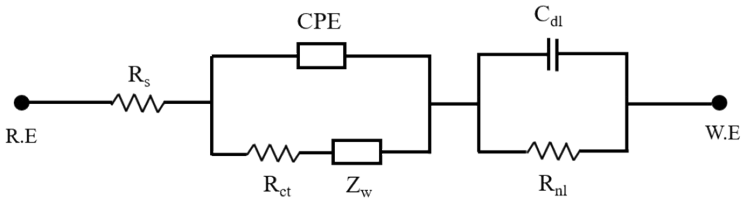

Figure S4. Equivalent circuit diagram of Nyquist plot.

References

(1) L. An, P. Zhou, J. Yin, H. Liu, F. Chen, H. Liu, Y. Du and P. Xi, Phase Transformation Fabrication of a Cu_2S Nanoplate as an Efficient Catalyst for Water Oxidation with Glycine, *Inorg. Chem.*, 2015, **54**, 3281–3289.

(2) X. Zhao, L. Liu, Y. Zhang, H. Zhang and Y. Wang, Uniquely Confining Cu_2S Nanoparticles in Graphitized Carbon Fibers for Enhanced Oxygen Evolution Reaction, *Nanotechnology*, 2017, **28**, 345402.

(3) Q. Li, X. Wang, K. Tang, M. Wang, C. Wang and C. Yan, Electronic Modulation of Electrocatalytically Active Center of Cu_7S_4 Nanodisks by Cobalt Doping for Highly Efficient Oxygen Evolution Reaction, *ACS Nano*, 2017, **11**, 12230−12239.

(4) L. He, D. Zhou, Y. Lin, R. Ge, X. Hou, X. Sun and C. Zheng, Ultrarapid in situ Synthesis of Cu_2S Nanosheet Arrays on Copper Foam with Room-Temperature-Active Iodine Plasma for Efficient and Cost-Effective Oxygen Evolution, *ACS Catal.*, 2018, **8**, 3859−3864.

(5) H. Zhang, H. Jiang, Q. Xu, Y. Hu and C. Li, Rapid Low-temperature Synthesis of Hollow $CuS_{0.55}$ Nanoparticles for Efficient Electrocatalytic Water Oxidation, *Chem. Eng. J.*, doi.org/10.1016/j.ces.2018.10.011.

(6) H. Liang, W. Shuang, Y. Zhang, S. Chao, H. Han, X. Wang, H. Zhang and L. Yang, Graphene-Like Multilayered CuS Nanosheets Assembled into Flower-Like Microspheres and Their Electrocatalytic Oxygen Evolution Properties, *ChemElectroChem*, 2018, **5**, 494–500.

(7) S. Zhang, Y. Sun, F. Liao, Y. Shen, H. Shi and M. Shao, Co_9S_8-CuS-FeS Trimetal Sulfides for Excellent Oxygen Evolution Reaction Electrocatalysis, *Electrochim. Acta*, 2018, **283**, 1695–1701.

(8) L. An, Y. Li, M. Luo, J. Yin, Y.-Q. Zhao, C. Xu, F. Cheng, Y. Yang, P. Xi and S. Guo, Atomic-Level Coupled Interfaces and Lattice Distortion on CuS/NiS_2 Nanocrystals Boost Oxygen Catalysis for Flexible Zn-Air Batteries, *Adv. Funct. Mater.*, 2017, **27**, 1703779.