Supporting Information (SI)

Chemically reduced CuO-Co_3O_4 composite as highly efficient electrocatalyst for oxygen evolution reaction in alkaline media

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Figure S1: Elemental mapping images of pristine CuO-Co_3O_4 and chemically reduced CuO-Co_3O_4 composite

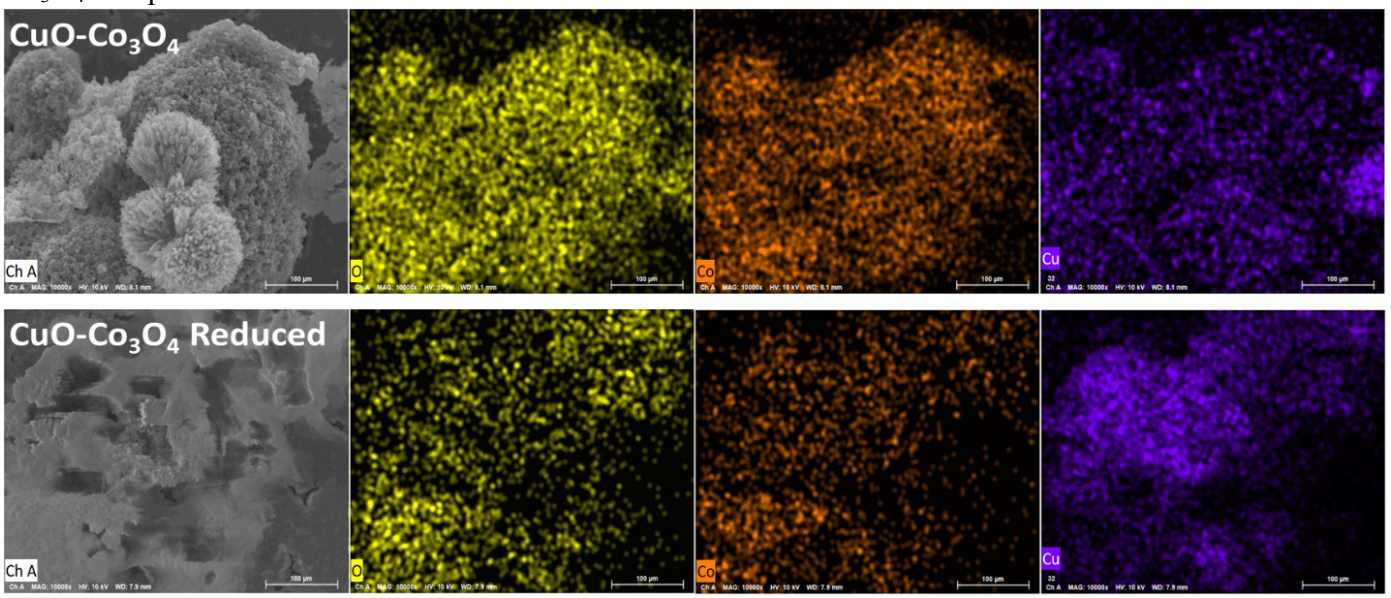

Figure S2: HRTEM images and SAED pattern of pristine CuO-Co_3O_4 (a, c) and chemically reduced CuO-Co_3O_4 (b, d)

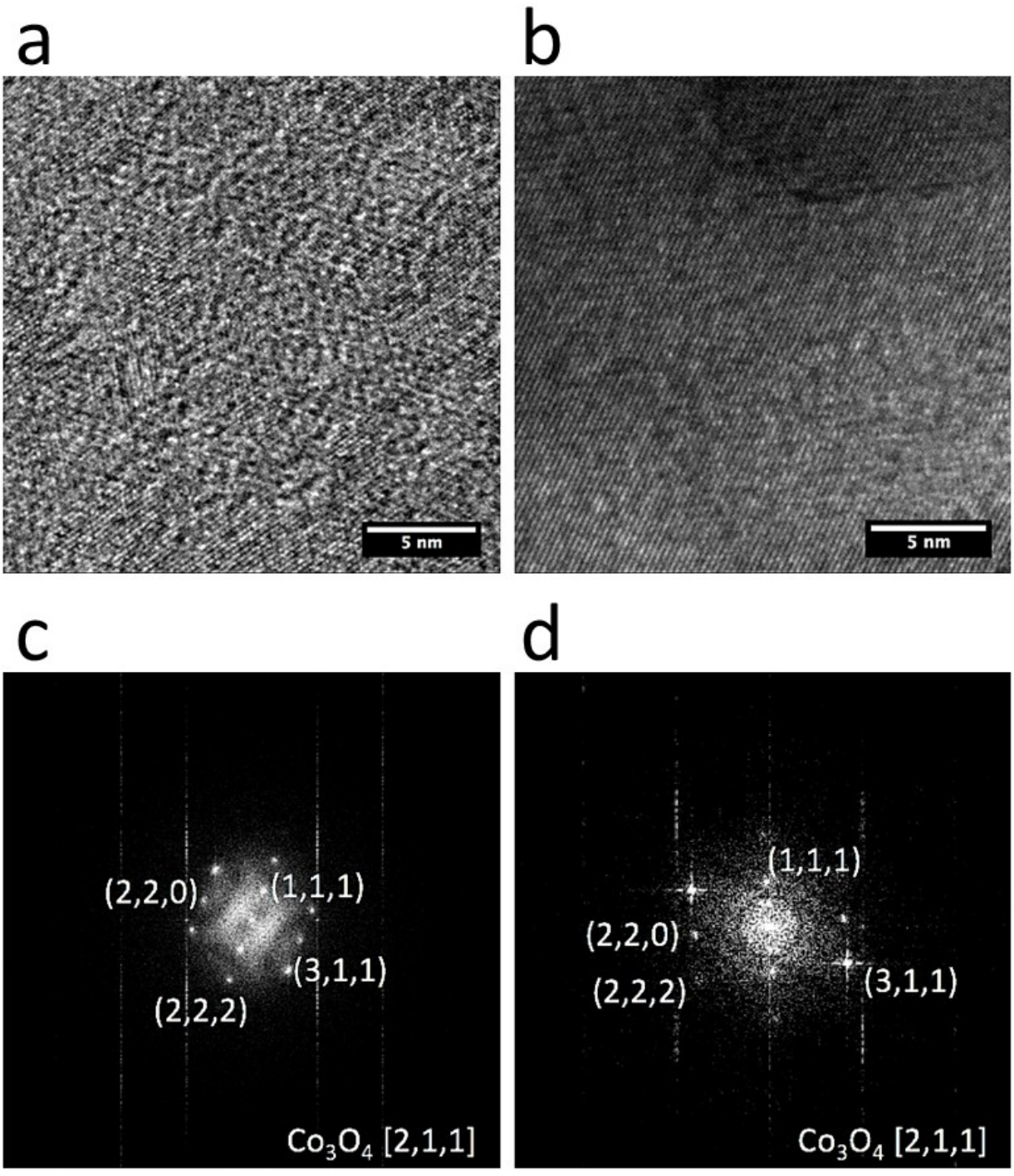

Figure S3: SEM image of chemically reduced CuO-Co_3O_4 after chronoamperometric stability experiment

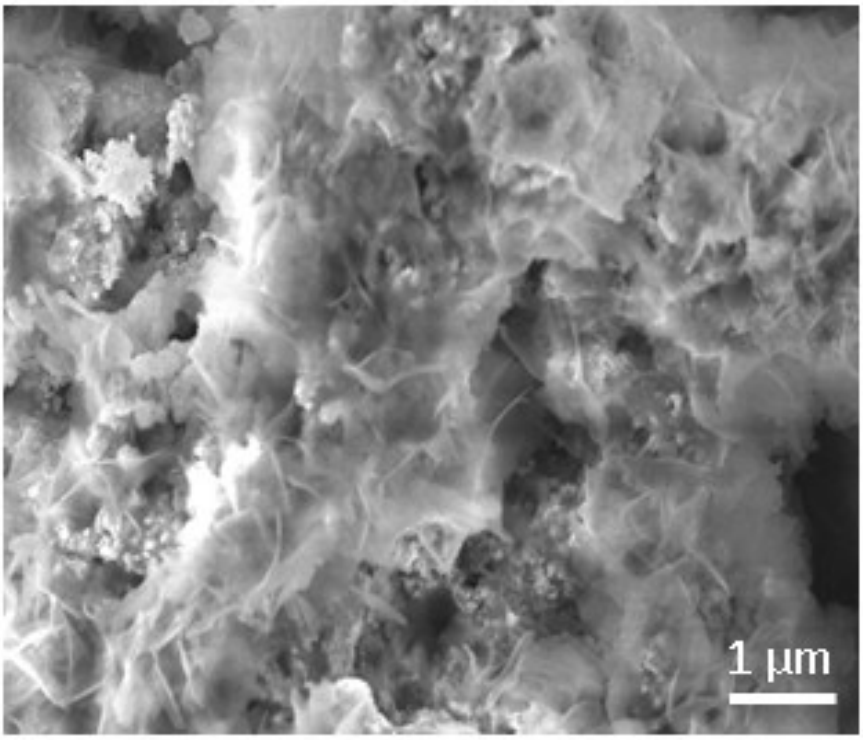

Figure S3: Cyclic voltammetry (CV) curves vs. RHE at the different scan rates for the calculation of double layer capacitance of Co_3O_4, CuO, pristine CuO-Co_3O_4 and chemically reduced CuO-Co_3O_4 composite

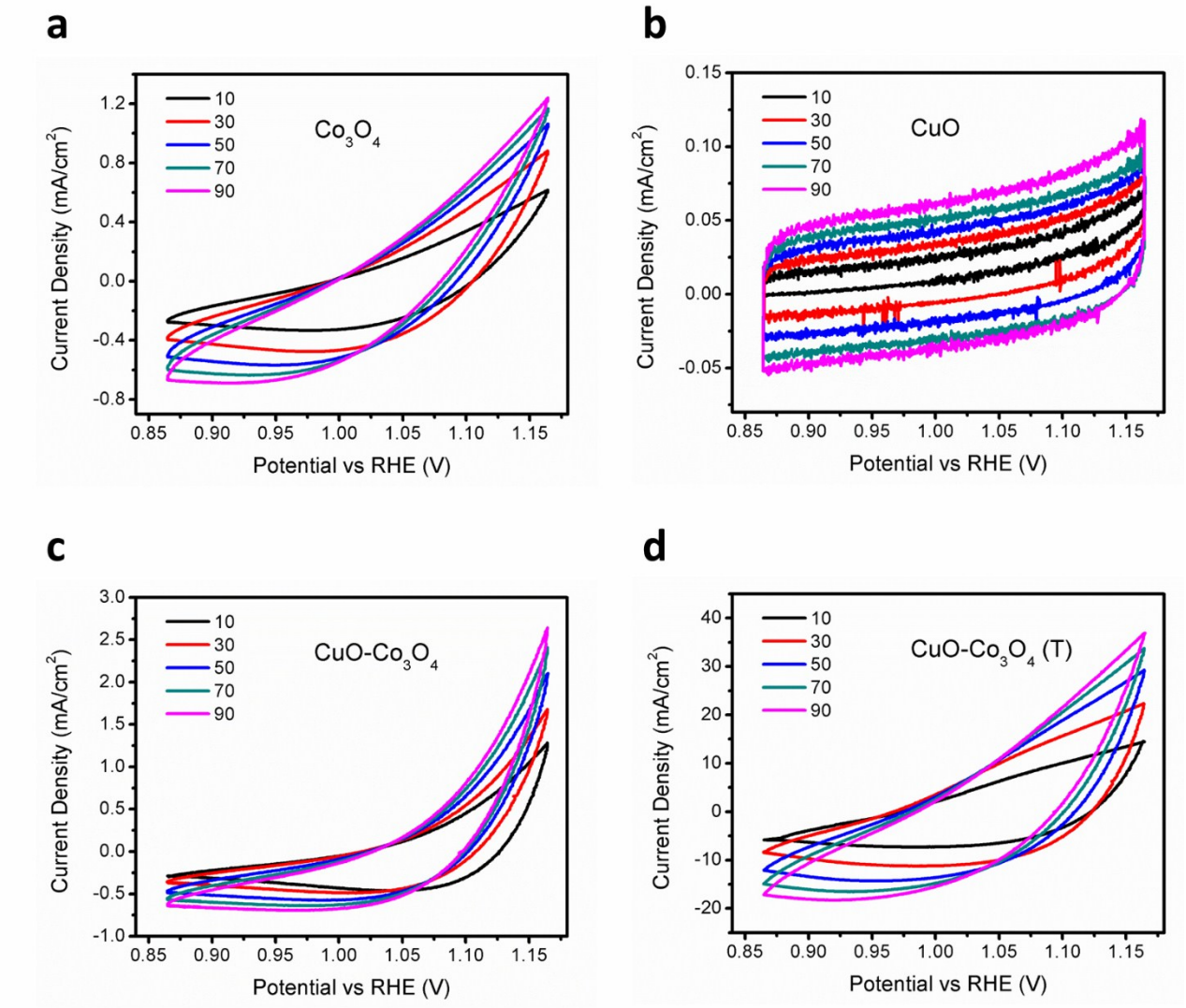

Figure S4: The linear fitting of non-faradic current vs different scan rates

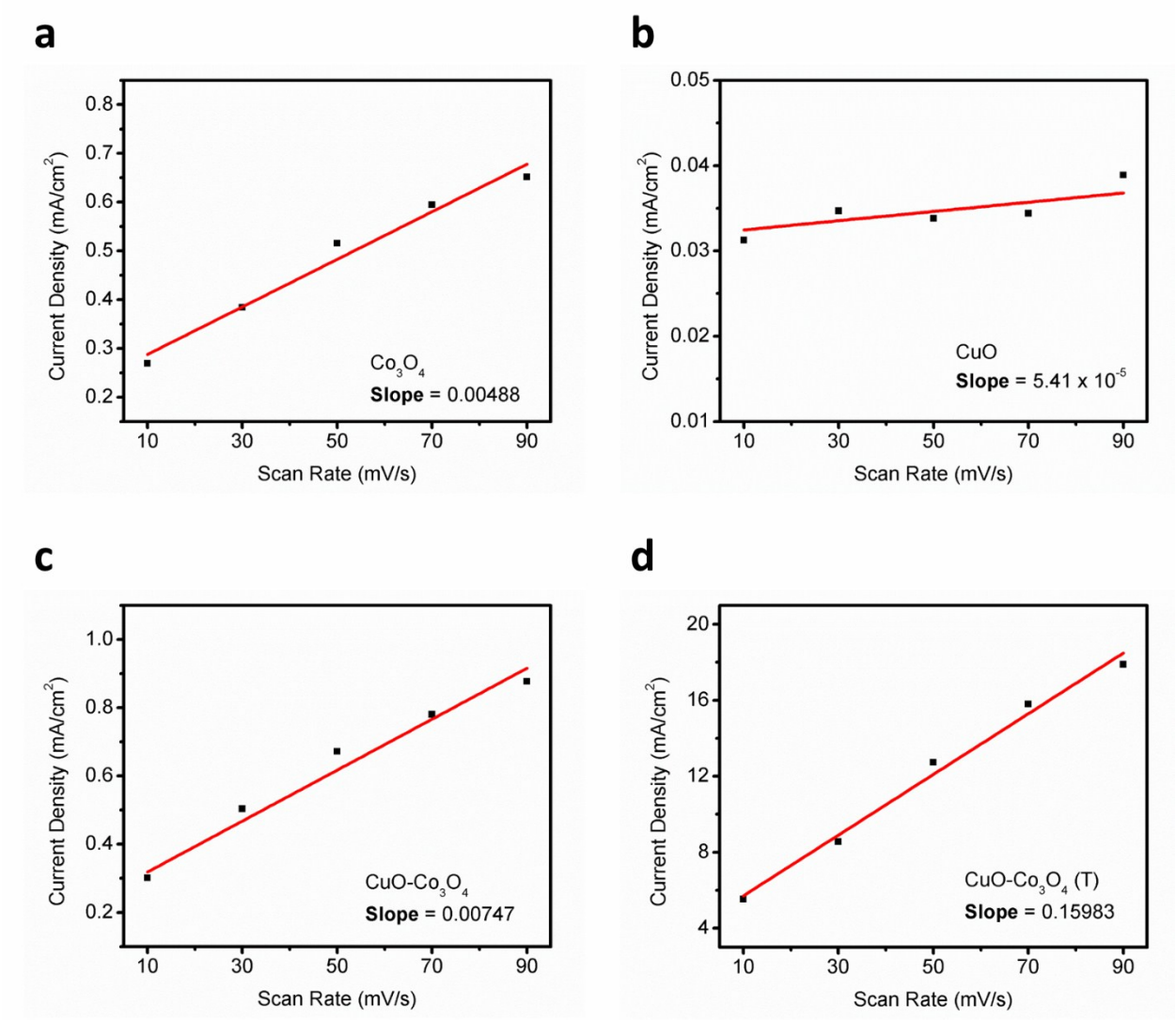

Table S1: Comparison of figure of merits chemically reduced CuO-Co_3O_4 composite as OER catalyst with recently reported electrocatalysts.

Electrocatalyst	**Electrolyte**	**Current Density**	**Overpotential**	**Tafel Slope**	**Ref.**
Reduced CuO-Co_3O_4	1M KOH	40 mA cm^2 100 mA cm^2	144.5 mV 183.4 mV	74 mV dec^{-1}	This work
N-doped CoO nanowires	1M KOH	10 mA cm^2 100 mA cm^2	319 mV 410 mV	74 mV dec^{-1}	1
$MnCo_2S_4$	1M KOH	10 mA cm^2	290 mV	71 mV dec^{-1}	2
Ni/NiS/NC	1M KOH	10 mA cm^2	337 mV	52 mV dec^{-1}	3
$CoFe_{0.7}Se_{1.7}$	1M KOH	10 mA cm^2 50 mA cm^2	279 mV 311 mV	43.9 mV dec^{-1}	4
Co-doped CuO	1M KOH	50 mA cm^2 100 mA cm^2	299 mV 330 mV	134 mV dec^{-1}	5
$CoFe_2O_4$	1M NaOH	10 mA cm^2	490 mV	54.2 mV dec^{-1}	6
$Ni_{2.2}Fe(OH)_x$	1M KOH	100 mA cm^2	234 mV	64.3 mV dec^{-1}	7
Ni-B/Ni foam	1M KOH	100 mA cm^2	360 mV	76 mV dec^{-1}	8

References:

1 K. Zhang, X. Xia, S. Deng, D. Xie, Y. Lu, Y. Wang, J. Wu, X. Wang, J. Tu, *J. of Ene. Chemistry.*, **2019**, 37, 13-17.

2 H.S. Jadhav, A. Roy, G.M. Thorat, W.J. Chung, J.G. Seo, *J. of Indus.& Eng. Chemistry.*, 2019, **71**, 452-459.

3 J. Ding, S. Jia, H. Wang, H. Gai, F. Liu, V. Linkov, R. Wang, *Intern. J. of Hydrogen Energy.*, 2019, **44**, 2832–2840.

4 X. Wang, Y. Zhouab, M. Liu, C. Chen, J. Zhang, *Electrochimica Acta.*, 2019, **297**, 197-205.

5 X. Xiong, C. You, Z. Liu, A.M. Asiri, X. Sun, *ACS Sust. Chem. & Engin.*, 2018, **6**, 2883-2887.

6. J.S. Sagu, D. Mehta, K.G.U. Wijayantha, *Electro. Commun.*, 2018, **87**, 1-4.

7 T. Zhou, Z. Cao, P. Zhang, H. Ma, Z. Gao, H. Wang, Y. Lu, J. He, Y. Zhao, *Scientific Reports*, 2017, **7**, 46154.

8 Y. Liang, X. Sun, A.M. Asiri, Y. He, *Nanotechnology*, 2016, **27**, 12LT01.