Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Electronic Supplementary Information

Template-free solvothermal preparation of ternary hollow balloons as RuO_2-like efficient electrocatalysts for oxygen evolution reaction with superior stability

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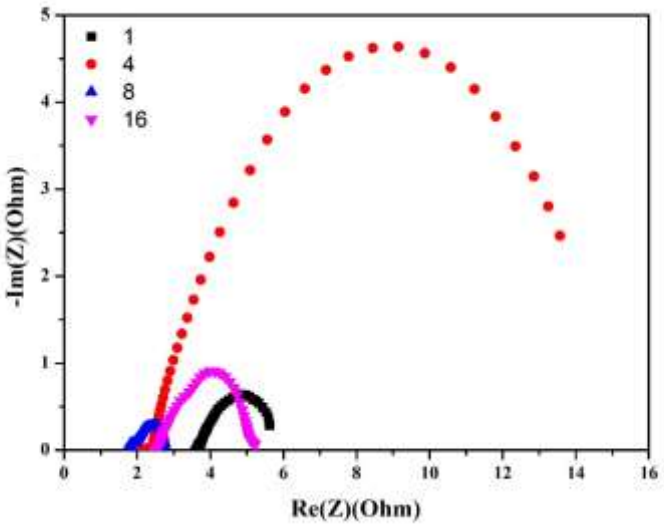

Figure S1. Nyquist plots of 1h-FNSH, 4h-FNSH, 8h-FNSH and 16h-FNSH electrodes recorded at an applied potential of 0.5 V with a frequency range of 100 kHz to 100 mHz in 1 M KOH

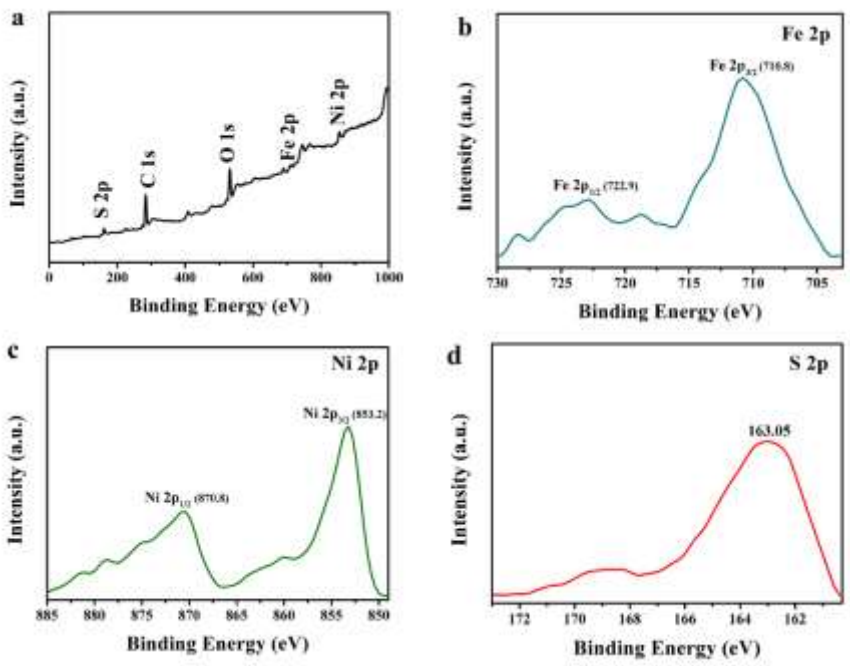

Figure S2. XPS survey spectra (a) of FNSH and the XPS spectra of Fe 2p (b), Ni 2p (c), and S 2p (d) for FNSH.

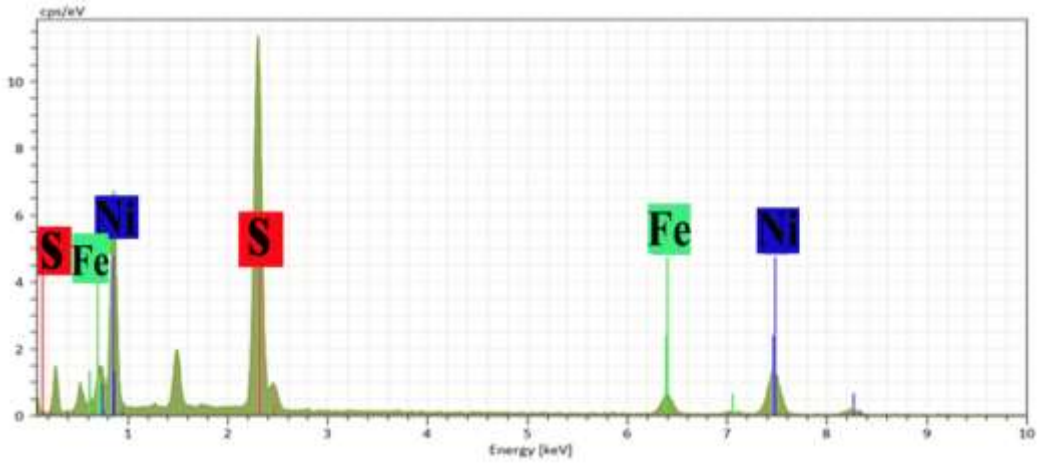

Figure S3. EDX patterns of FNSH

Table S1. Quantification results of EDX of FNSH

Sample	Concentration (at. %)		
	Fe	Ni	S
FNSH	15.11	29.54	55.34

Table S2. ICP-OES result of FNSH

Sample	Concentration (μM)	
	Fe	Ni
FNSH	20.525	42.032

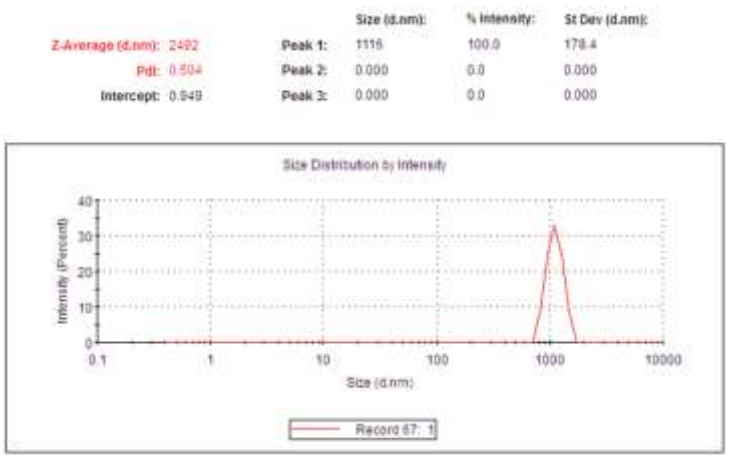

Figure S4. DLS result of 8h-FNSH.

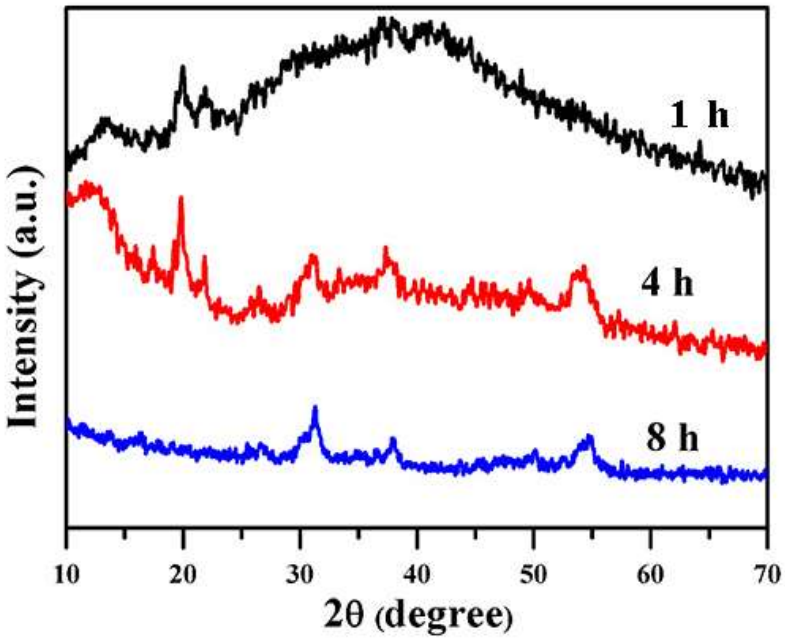

Figure S5. XRD patterns of FNS obtained with reaction time 1 h, 4 h and 8 h.

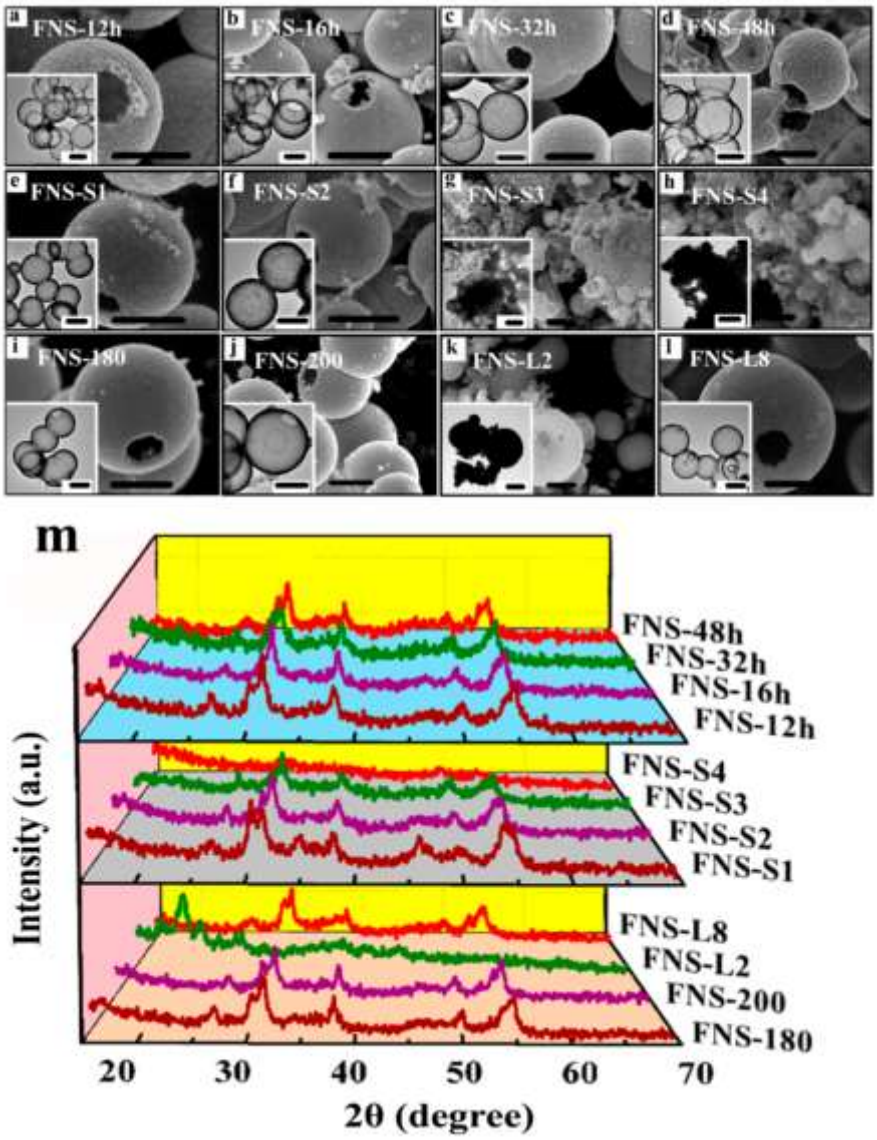

Figure S6. SEM and the corresponding TEM images (inset in the SEM images) of FNS obtained with different reaction times (a) 12 h, (b) 16 h, (c) 32 h, (d) 48 h; varying ratios of water-glycol (e) 1:0, (f) 2:1, (g) 1:2, (h) 0:1; different reaction temperatures (i) 180 ºC, (j) 200 ºC; multiple amounts of L-cysteine (k) 0.04 mol/L, (l) 0.16 mol/L;. Scale bars shown in all of the SEM and TEM images correspond to 2.0 um. XRD patterns of different FNS samples (m)

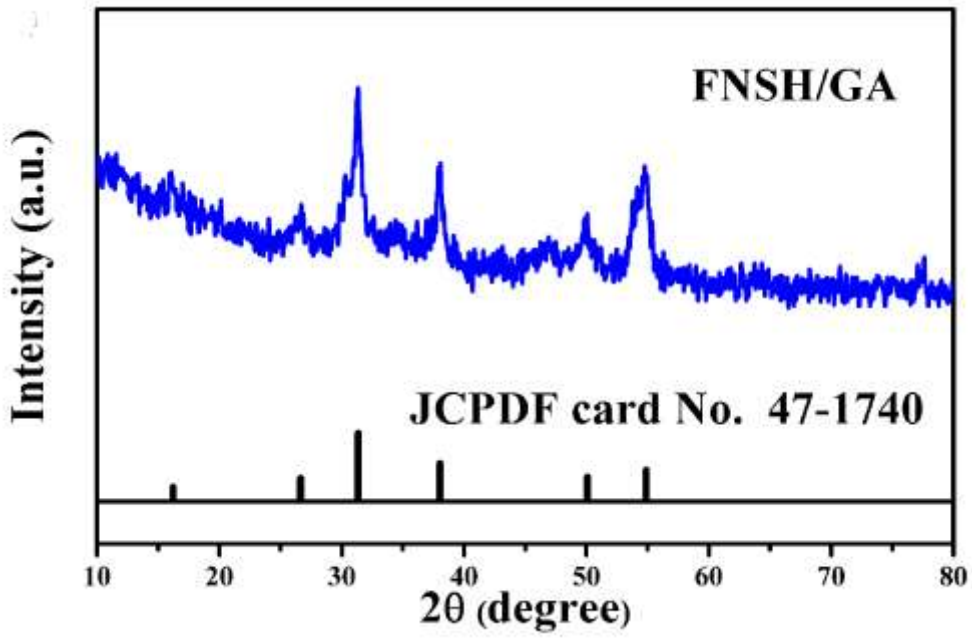

Figure S7. XRD pattern of FNSH/GA.

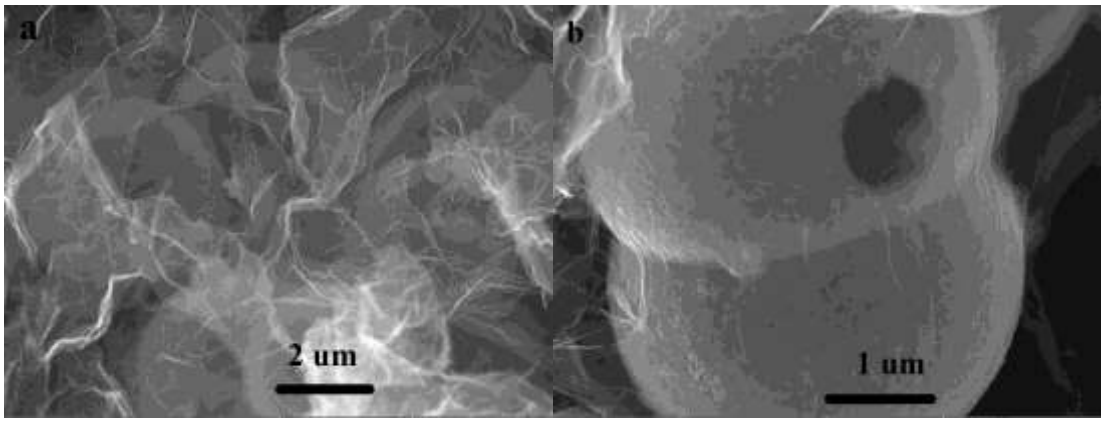

Figure S8. SEM images of FNSH/GA.

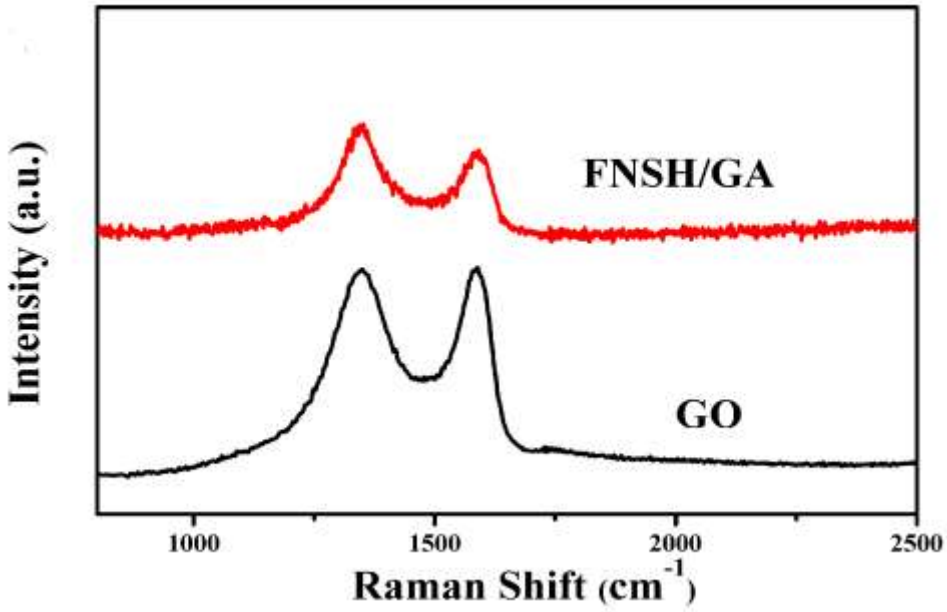

Figure S9. Raman spectrum of FNSH/GA.

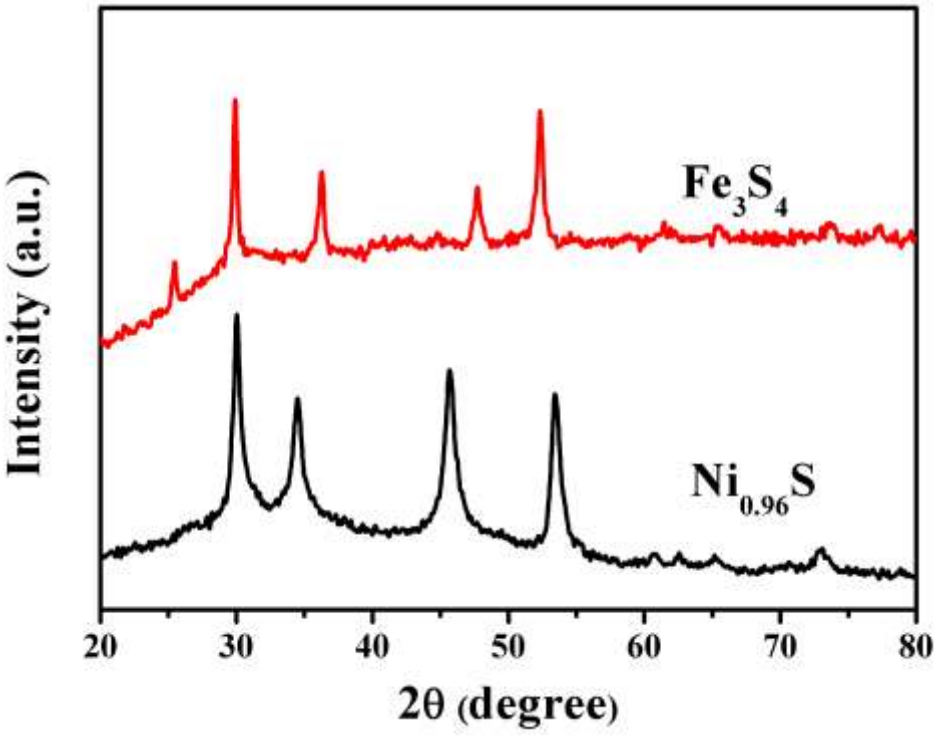

Figure S10. XRD patterns of $Ni_{0.96}S$ and Fe_3S_4.

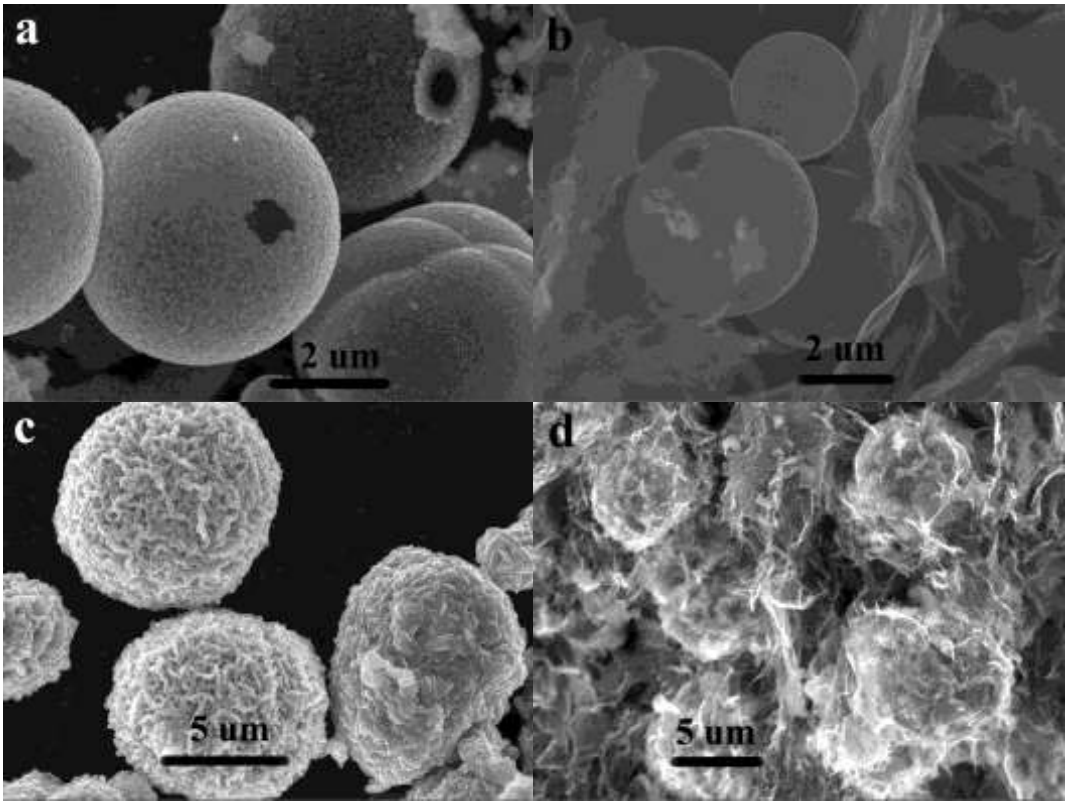

Figure S11. SEM images of $Ni_{0.96}S$ (a), $Ni_{0.96}S$/GA (b), Fe_3S_4 (c) and Fe_3S_4/GA (d).

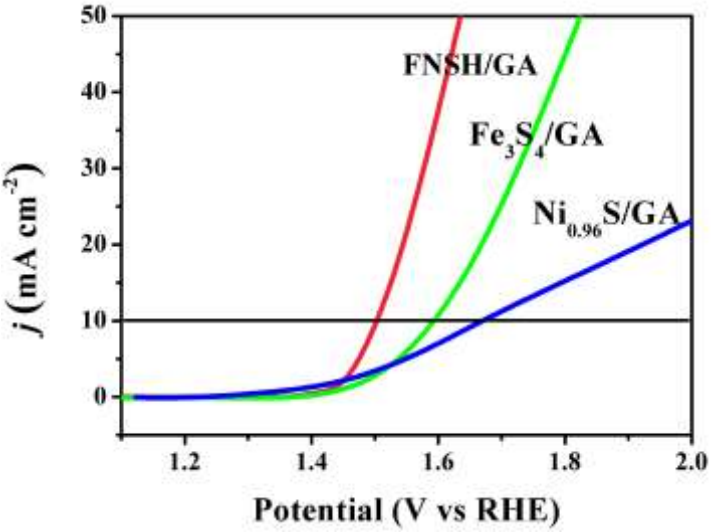

Figure S12. polarization curves of FNSH/GA, Fe_3S_4/GA, NiS/GA at 5 mV s^{-1}

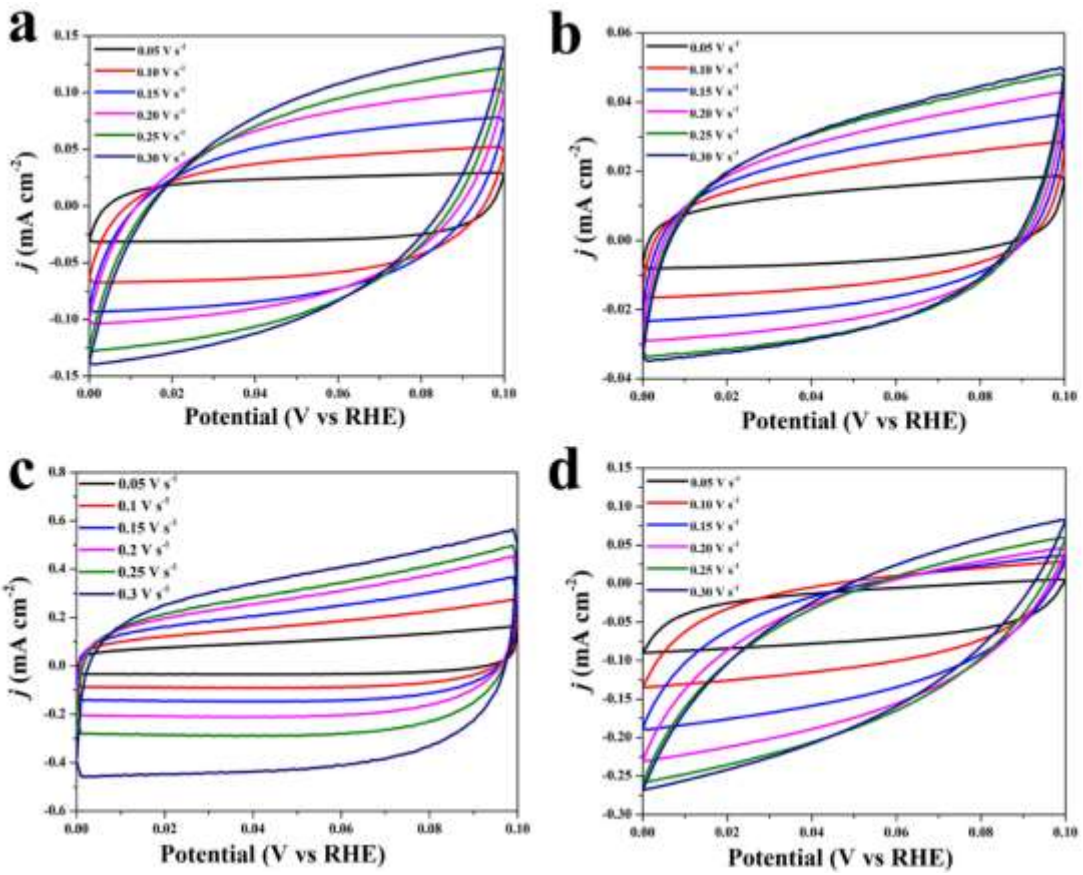

Figure S13. CV for $FeNi_2S_4$ under different reaction time, including (a) 1 h, (b) 4 h, (c) 8 h, (d) 16 h, with a scan rate of 0.05, 0.1, 0.15, 0.2, 0.25 and 0.3 V s^{-1} in 1.0 M KOH at the potential from 0 to 0.5 V.

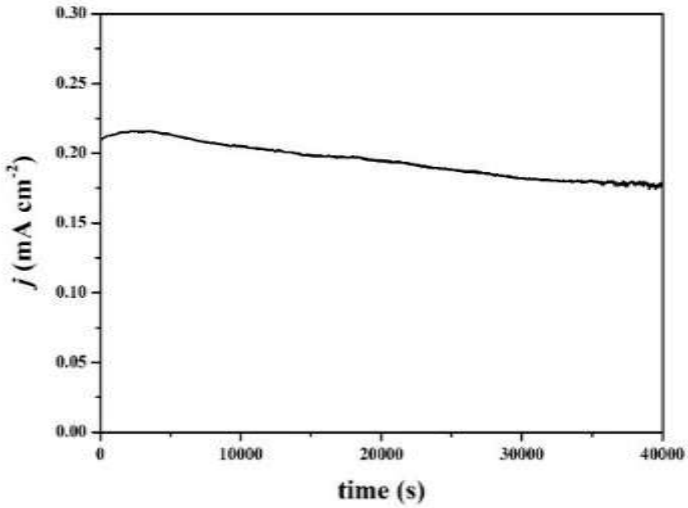

Figure S14. Durability tests for 8 h FNSH/GA at 10 mA cm^{-2}.

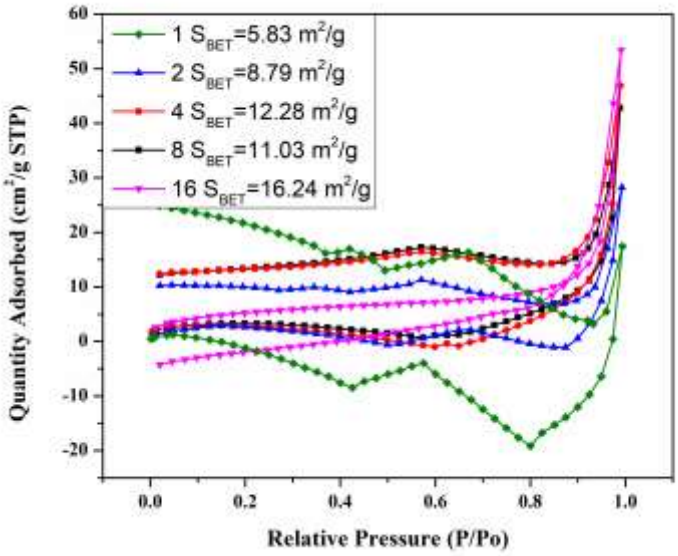

Figure S15. N_2 adsorption-desorption isotherms of different products under different reaction time, including 1 h, 2 h, 4 h, 8 h and 16 h.

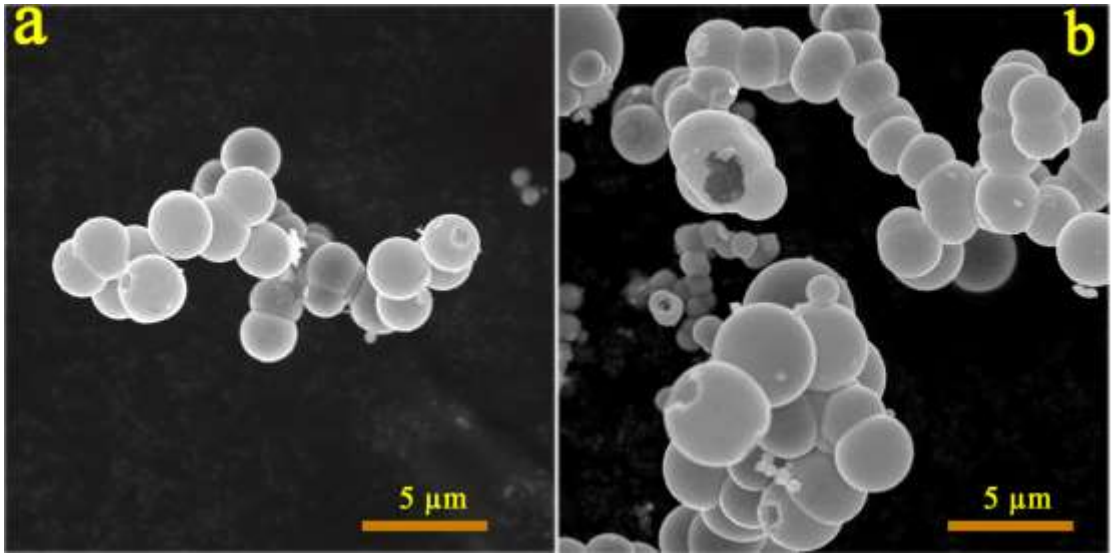

Figure S16. SEM images of $CuCo_2S_4$ (a) and $CoNi_2S_4$ (b)

References:

[1]. H. Chen, J. Jiang, L. Zhang, H. Wan, T. Qi and D. Xia, *Nanoscale.*, 2013, **5**, 8879.