Electronic Supplementary Material (ESI) for Materials Advances.


# Controllable synthesis of self-templated hierarchical $Ni_3S_2$@N-doped carbon for enhanced oxygen evolution reaction

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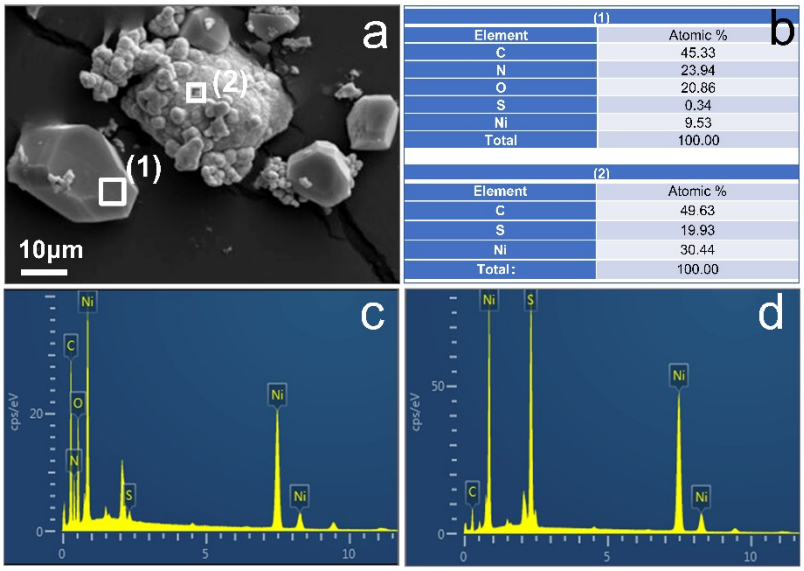


**Figure S1** SEM image (a), element analysis (b) and EDS spectra (b, d), of H-$Ni_3S_2$@NC-3/NF for polyhedron (1) and microsphere (2), respectively.

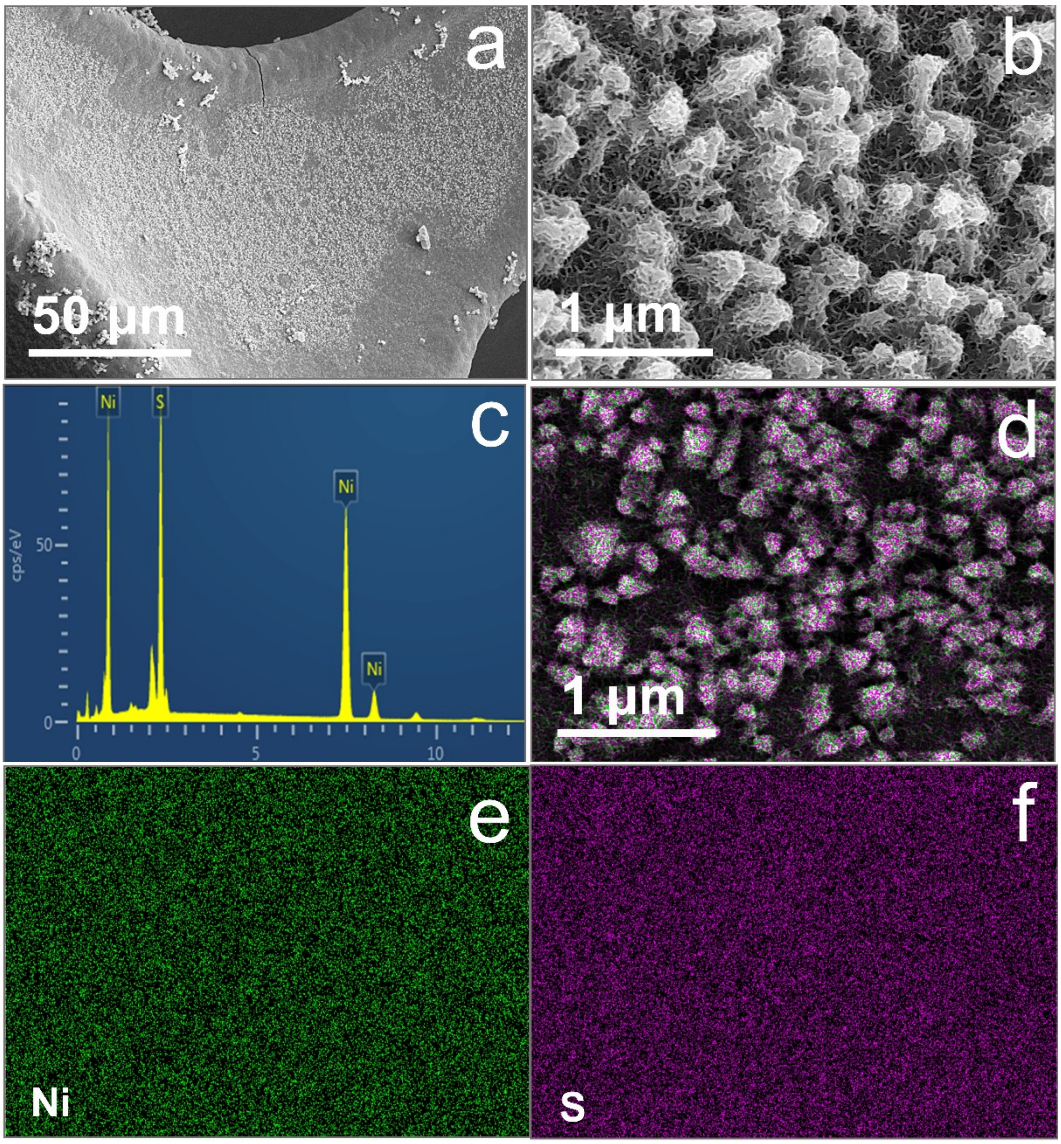


**Figure S2** SEM images (a, b), EDS spectrum (c), and elemental mapping images of total (d), Ni (e), and S (f) for nanocoral-like $Ni_3S_2$/NF.

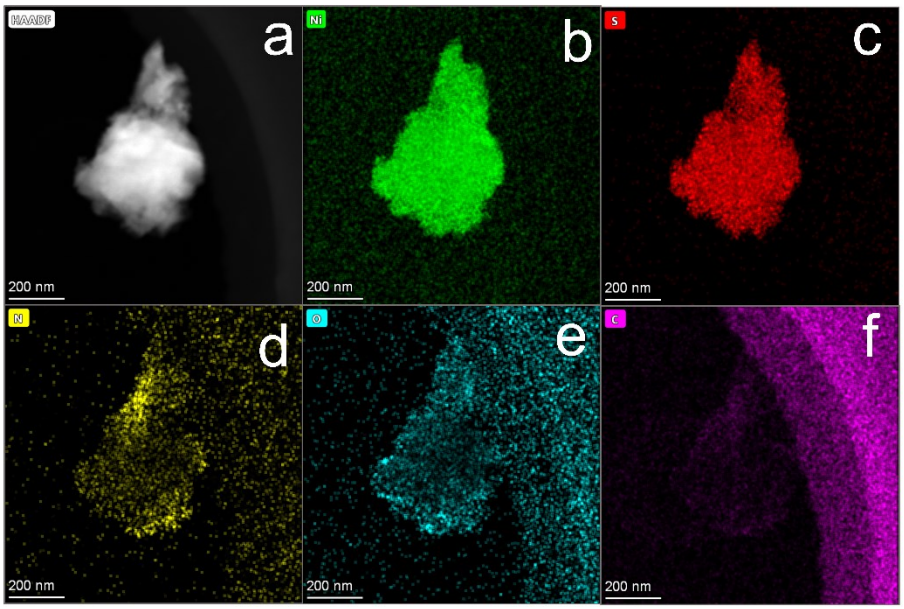


**Figure S3** HAADF image (a), and elemental mapping images of Ni (b), S (c), N (d), O (e), and C (f) for H-$Ni_3S_2$@NC-3/NF.

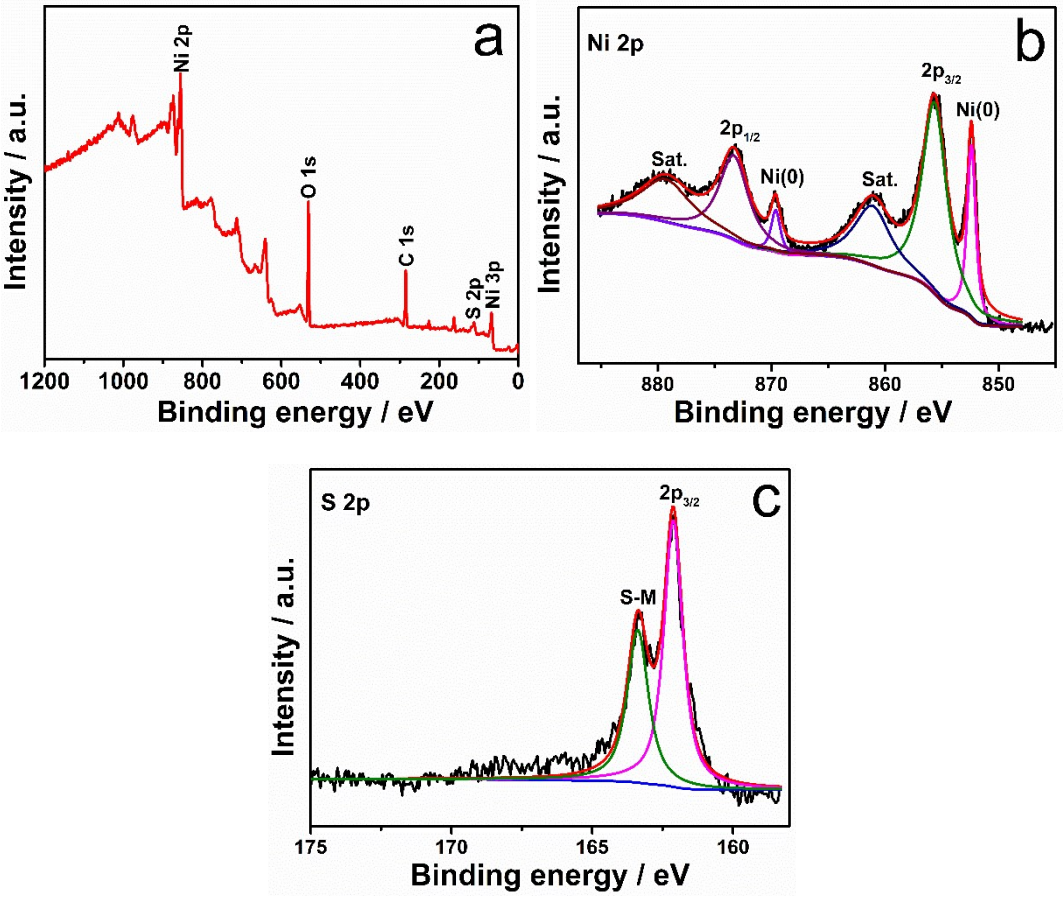


**Figure S4** XPS spectra of XPS survey (a), Ni 2p (b), and S 2p (c) for nanocoral-like $Ni_3S_2$/NF.

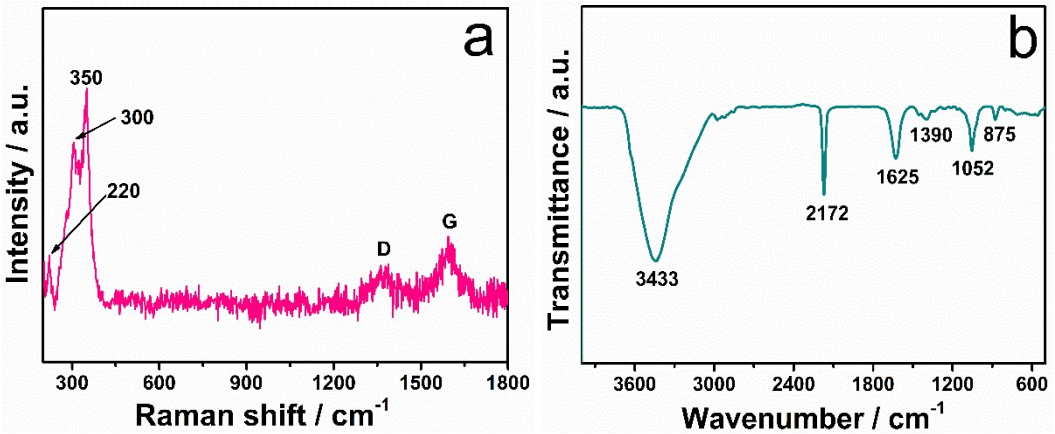


**Figure S5** Raman (a) and FTIR spectrum (b) of H-$Ni_3S_2$@NC-3/NF.

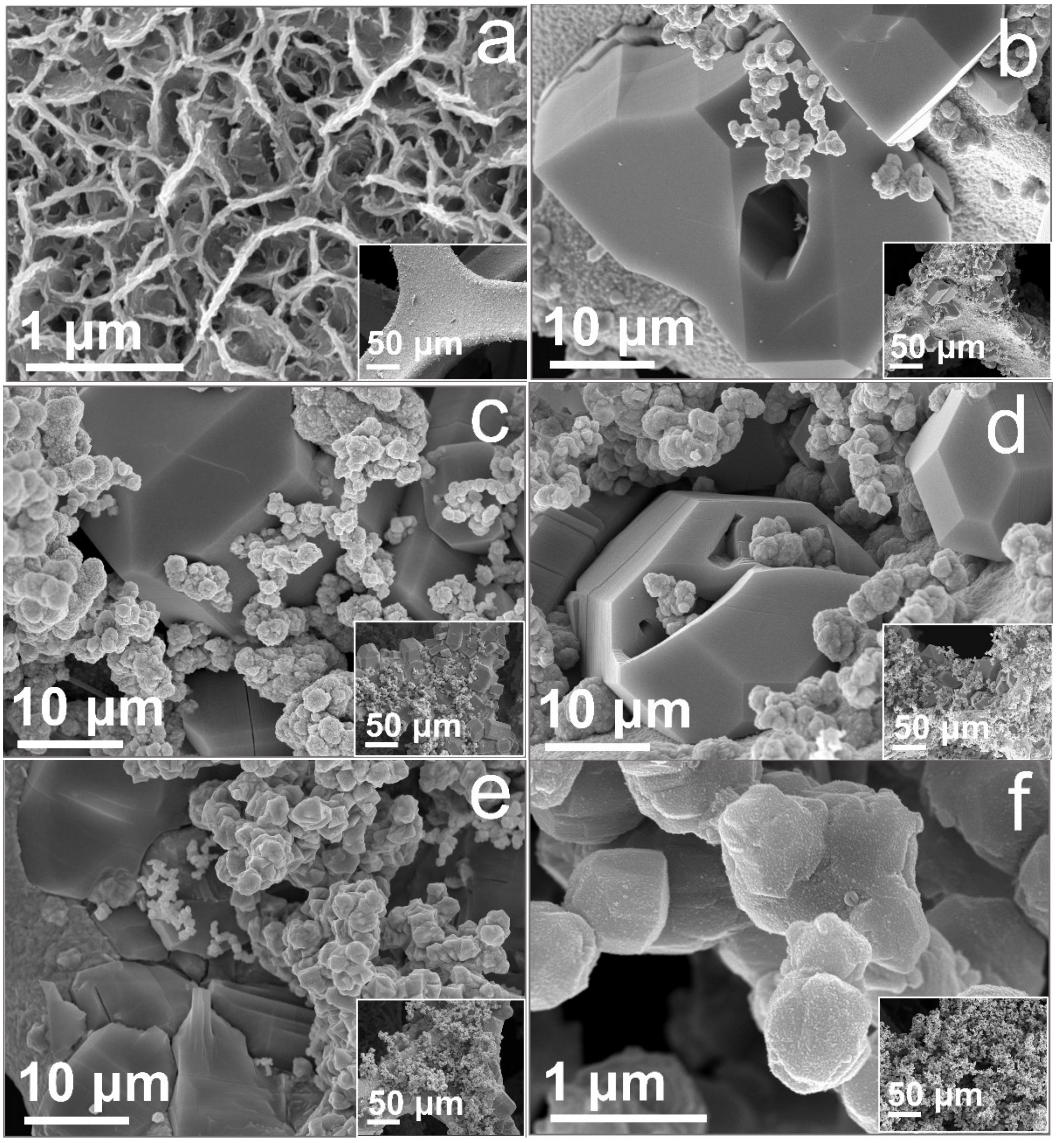


**Figure S6** SEM images of H-$Ni_3S_2$@NC-3/NF prepared at 140 ℃ (a), 150 ℃ (b), 160 ℃ (c), 170 ℃ (d), 180 ℃ (e), and 200 ℃ (f) for 8 h.

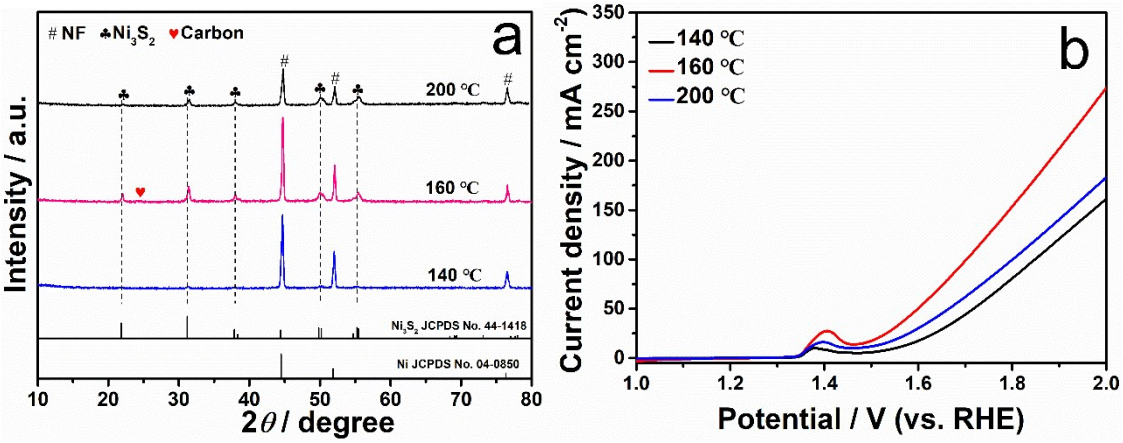


**Figure S7** XRD patterns (a) and polarization curves (b) of H-$Ni_3S_2$@NC-3/NF obtained at 140 ℃, 160 ℃, and 200 ℃ for 8 h.

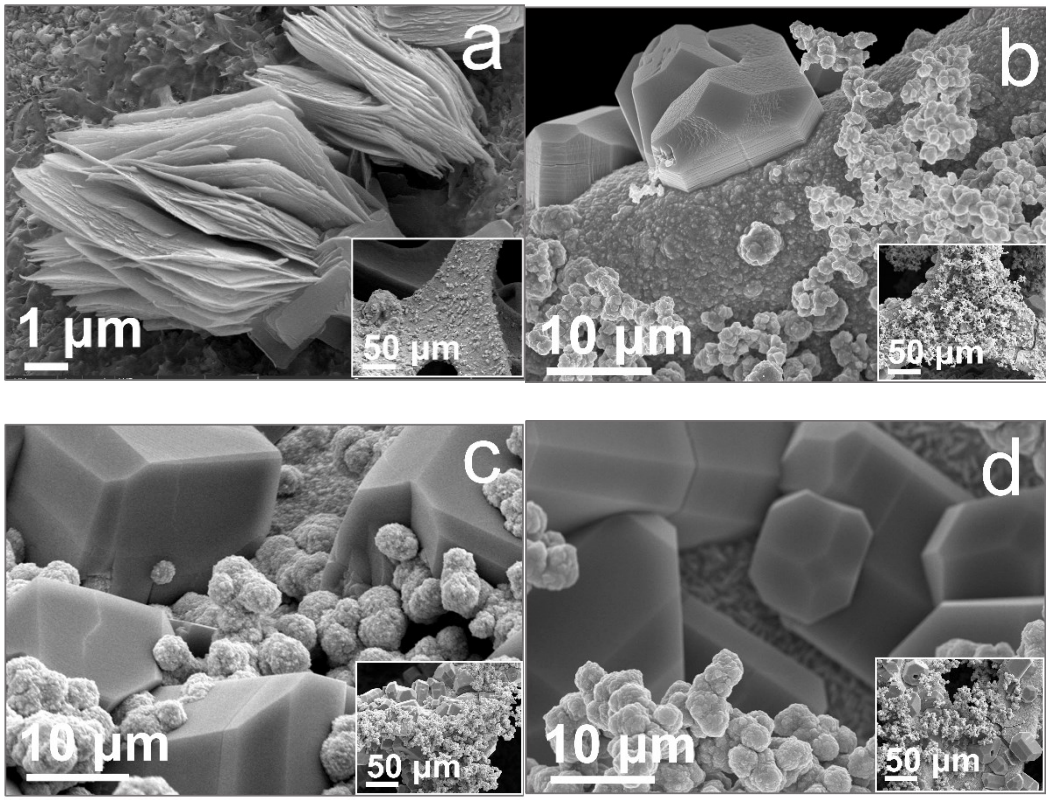


**Figure S8** SEM images of H-$Ni_3S_2$@NC-3/NF prepared at 160 ℃ for 2 h (a), 4 h (b), 14 h (c), and 20 h (d).

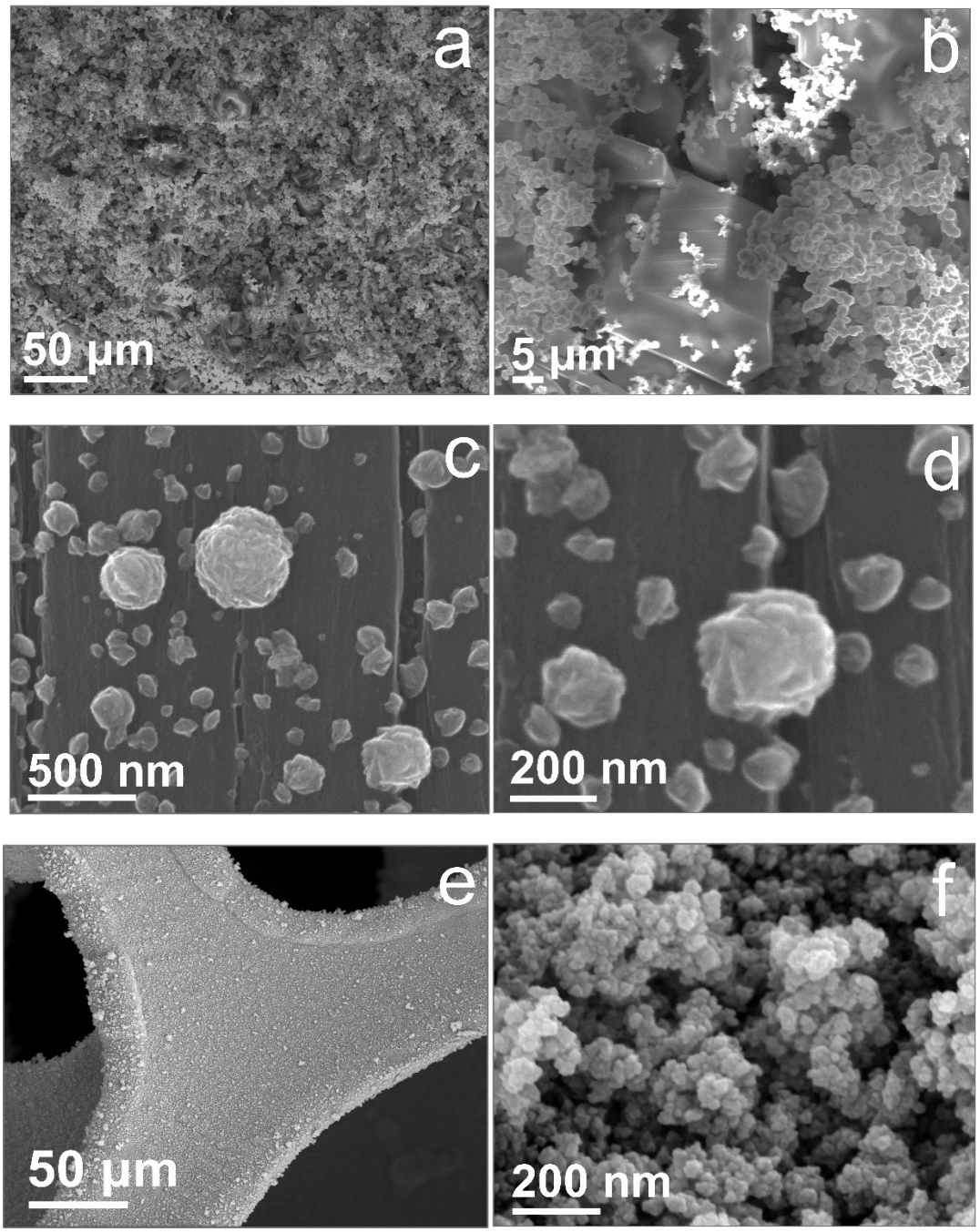


**Figure S9** SEM images of H-$Ni_3S_2$/NP (a, b), $Ni_3S_2$/CC (c, d), and $Ni_3S_2$/NF nanoparticle treated with $Na_2S$ (e, f).

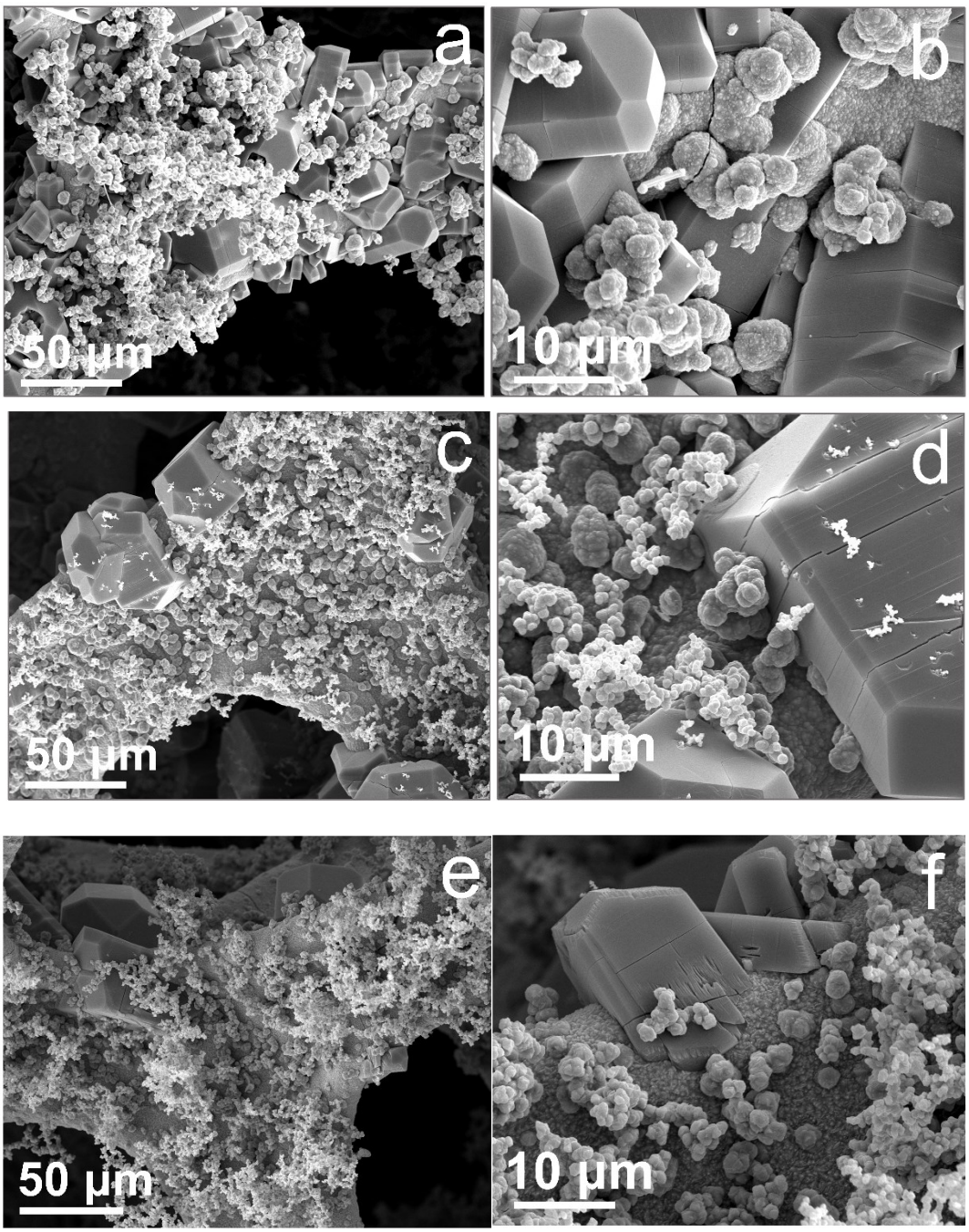


**Figure S10** SEM images of H-$Ni_3S_2$@NC-3/NF prepared with different $Ni^{2+}$ precursors of $Ni(NO_3)_2$ $6H_2O$ (a, b), $NiSO_4$ $6H_2O$ (c, d), and $Ni(CH_3COO)_2$ $4H_2O$ (e, f) at 160 ℃ for 8 h.

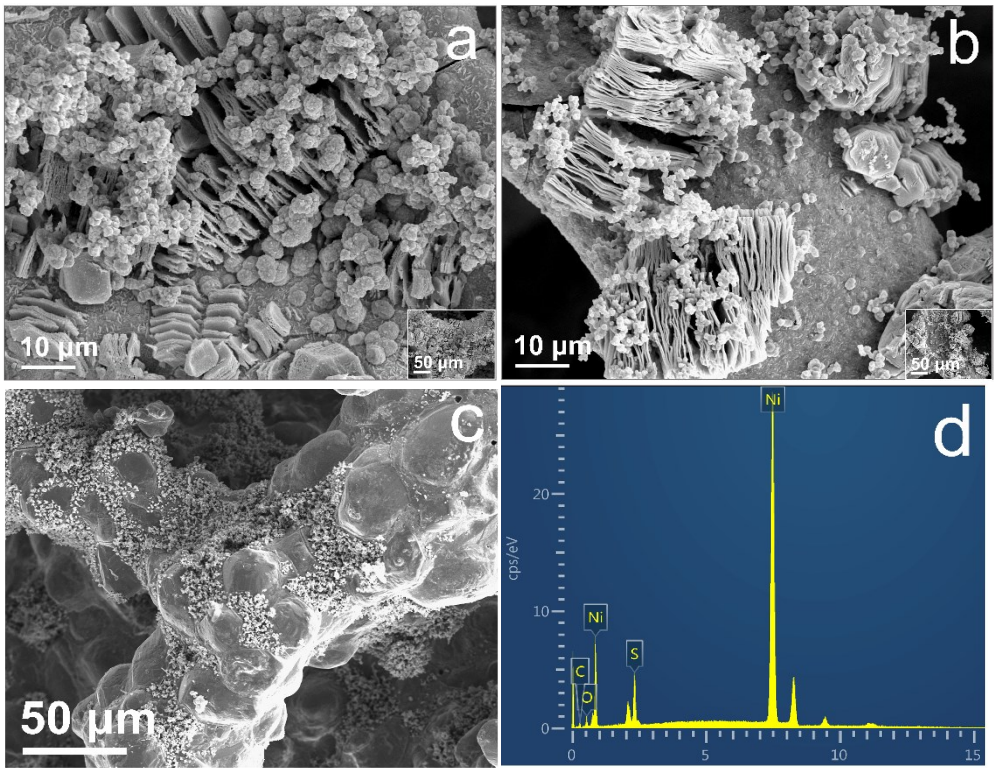


**Figure S11** SEM images of A-$Ni_3S_2$/C-500 (a), A-$Ni_3S_2$/C-600 (b), A-$Ni_3S_2$/C-700 (c), and EDS spectrum of A-$Ni_3S_2$/C-500 (d).

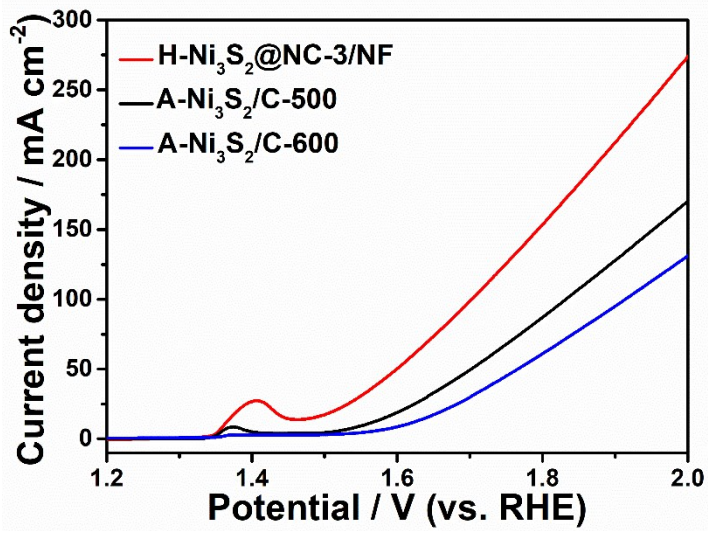


**Figure S12** Polarization curves of H-$Ni_3S_2$@NC-3/NF, A-$Ni_3S_2$/C-500 and A-$Ni_3S_2$/C-600.

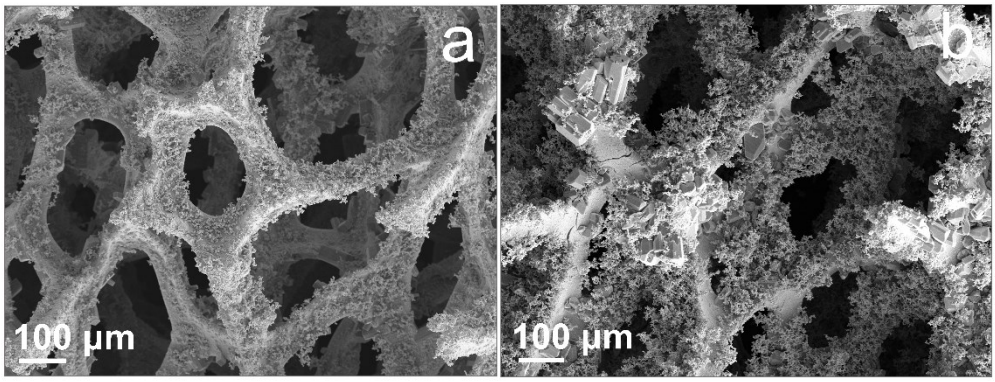


**Figure S13** SEM images of H-$Ni_3S_2$@NC-1/NF (a) and H-$Ni_3S_2$@NC-5/NF (b).

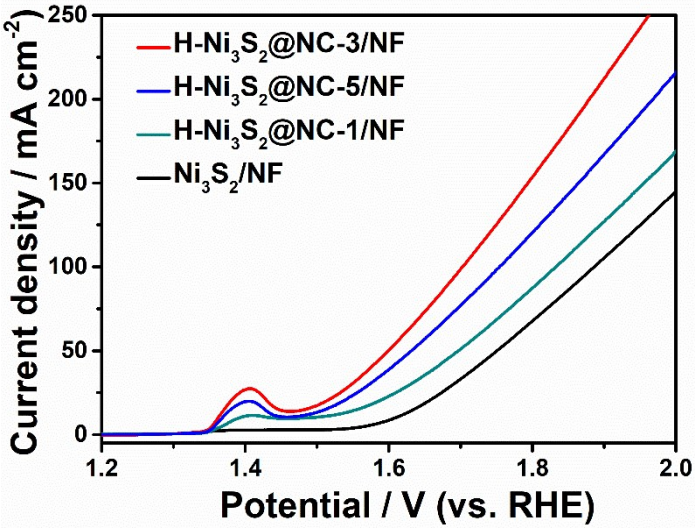


**Figure S14** Polarization curves of nanocoral-like $Ni_3S_2$/NF, H-$Ni_3S_2$@NC-1/NF, H-$Ni_3S_2$@NC-3/NF and H-$Ni_3S_2$@NC-5/NF.

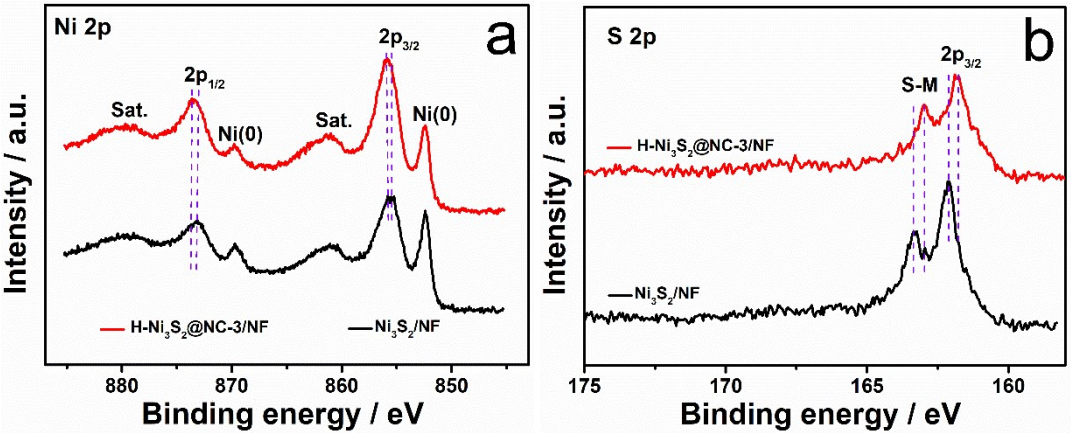


**Figure S15** XPS spectra of Ni 2p (a) and S 2p (b) for H-$Ni_3S_2$@NC-3/NF and nanocoral-like $Ni_3S_2$/NF.

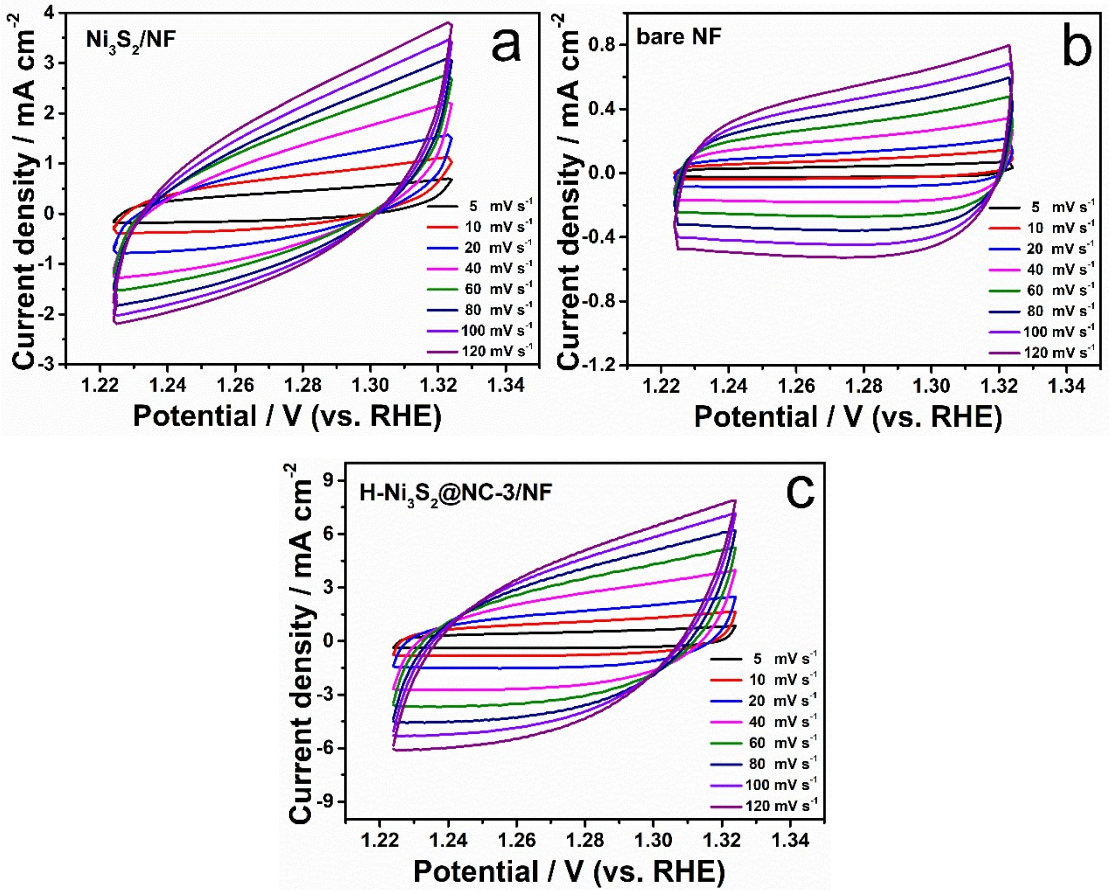


**Figure S16** CV curves of nanocoral-like $Ni_3S_2$/NF (a), bare NF(b) and H-$Ni_3S_2$@NC-3/NF (c) at different scan rates of 5-120 mV $s^{-1}$.

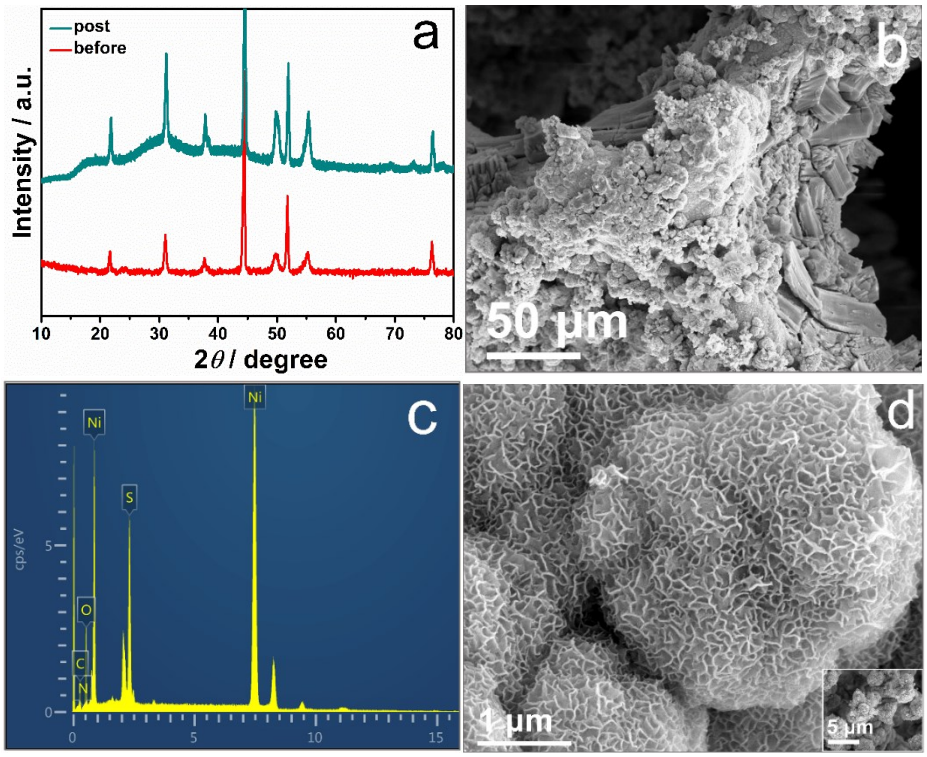


**Figure S17** XRD patterns (a), SEM images (b, d), and EDS spectrum (c) of H-$Ni_3S_2$@NC-3/NF after long-term test.

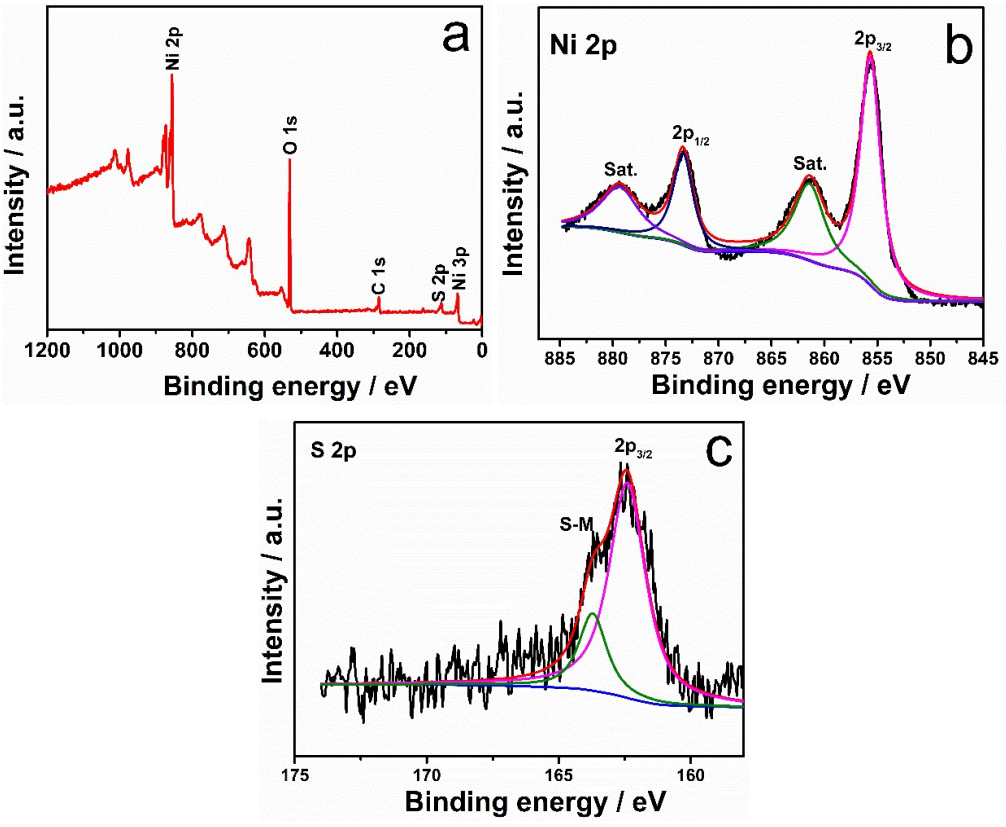


**Figure S18** XPS spectra of survey spectrum (a), Ni 2p (b), and S 2p (c) of H-$Ni_3S_2$@NC-3/NF post OER.