

Supporting Information

Fabrication of 3D Iron modified NiCo_2S_4 structure on Nickel foam as bifunctional electrocatalyst for Overall Water Splitting

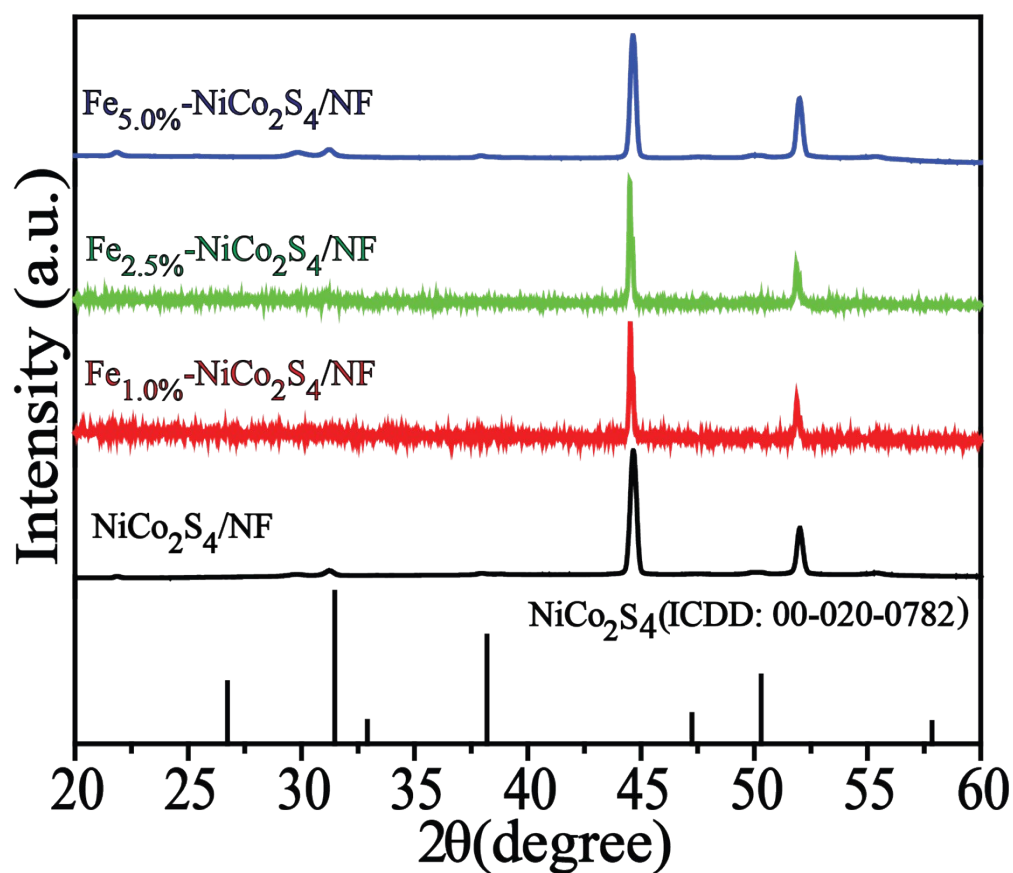


Figure S1. XRD pattern of (a) $\text{NiCo}_2\text{S}_4/\text{NF}$, (b) $\text{Fe}_{1.0\%}\text{-NiCo}_2\text{S}_4/\text{NF}$, (c) $\text{Fe}_{2.5\%}\text{-NiCo}_2\text{S}_4/\text{NF}$ and (d) $\text{Fe}_{5.0\%}\text{-NiCo}_2\text{S}_4/\text{NF}$.

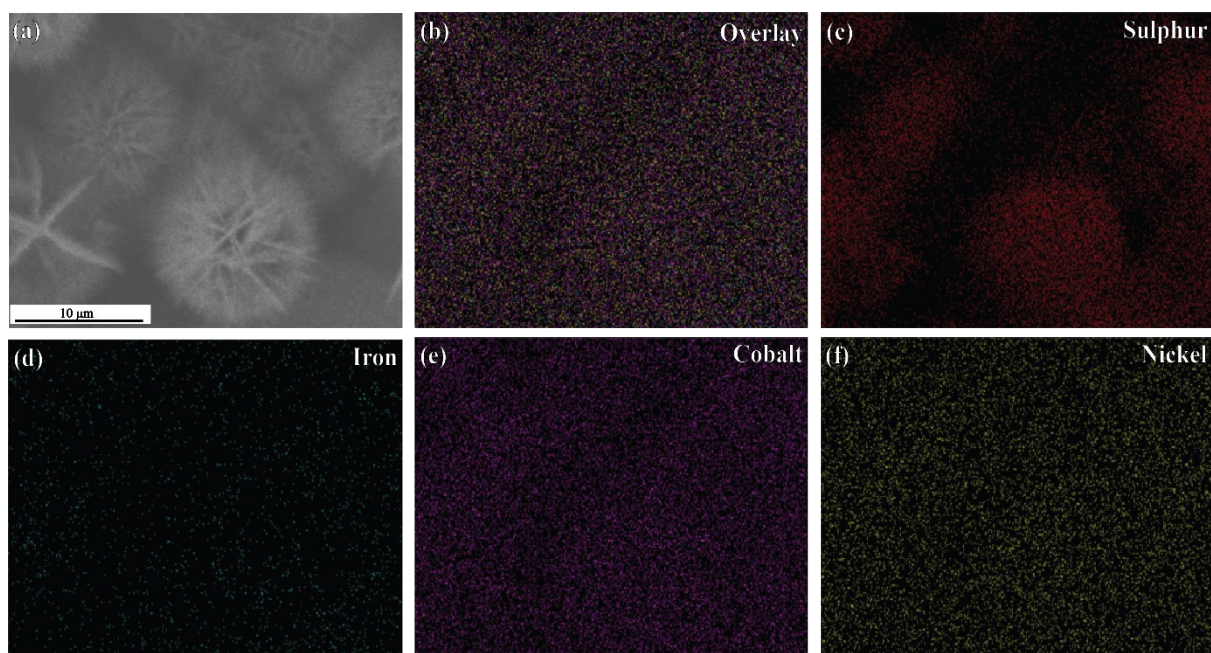


Figure S2. SEM elemental mapping of $\text{Fe}_{2.5\%}\text{-NiCo}_2\text{S}_4/\text{NF}$.

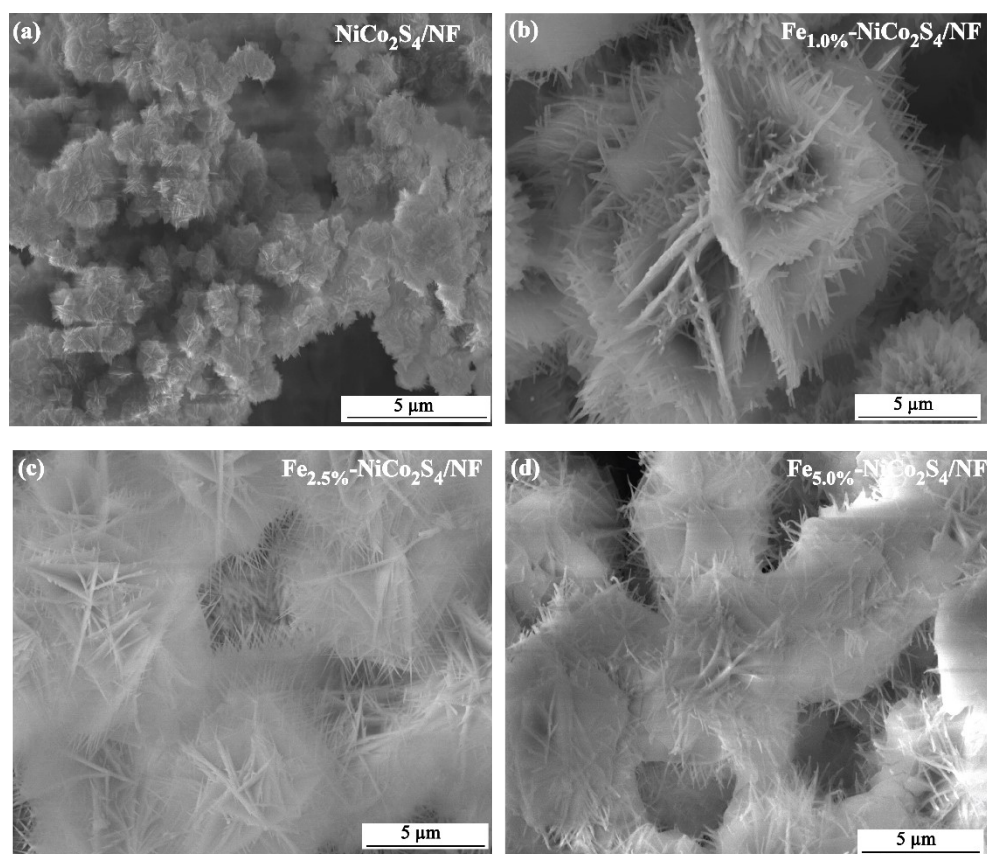


Figure S3. SEM images of (a) $\text{NiCo}_2\text{S}_4/\text{NF}$, (b) $\text{Fe}_{1.0\%}\text{-NiCo}_2\text{S}_4/\text{NF}$, (c) $\text{Fe}_{2.5\%}\text{-NiCo}_2\text{S}_4/\text{NF}$ and (d) $\text{Fe}_{5.0\%}\text{-NiCo}_2\text{S}_4/\text{NF}$.

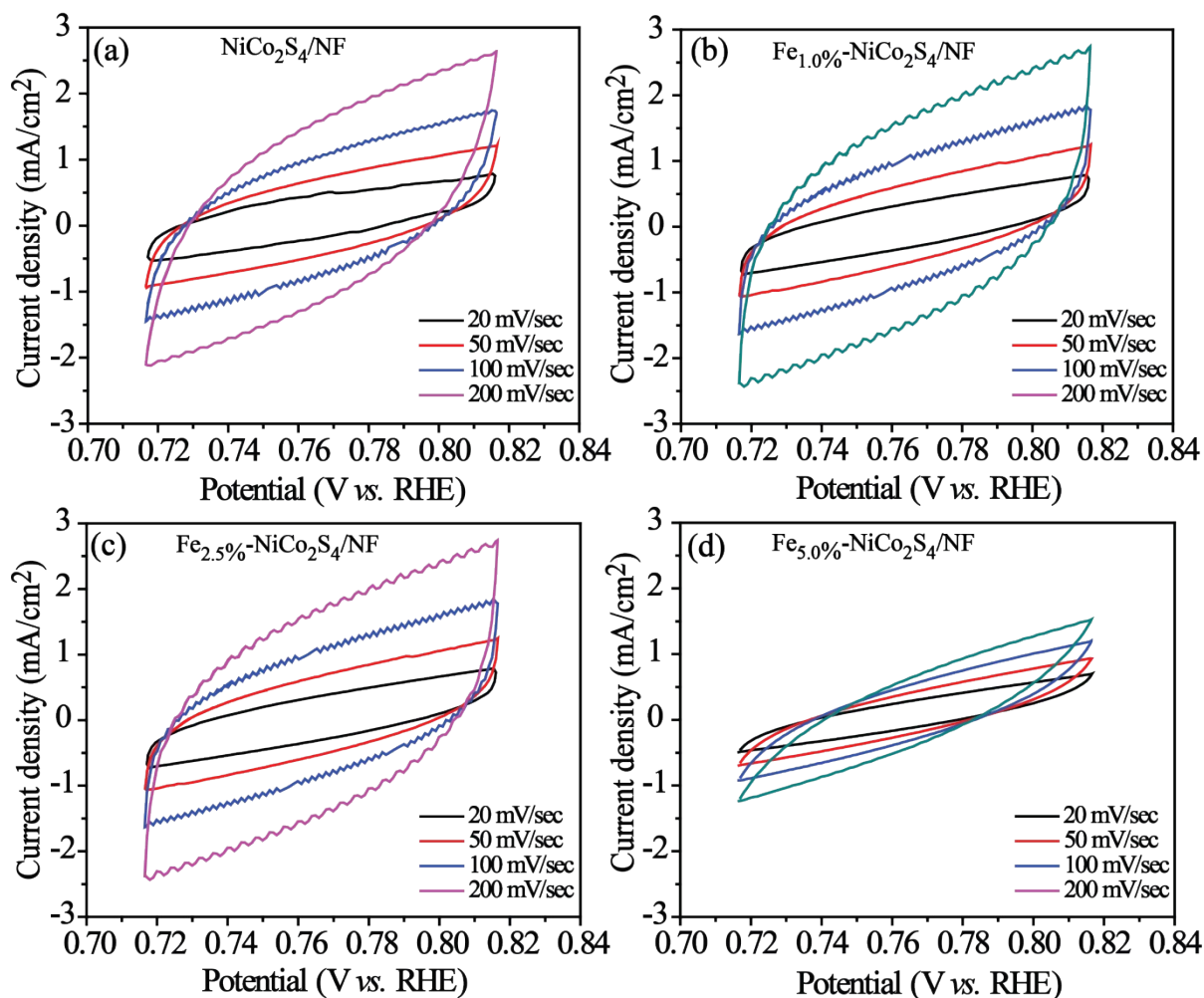


Figure S4. Cyclic voltammograms of the catalyst in the non-faradaic region recorded at different scan rates in the N_2 -saturated 1 M KOH solution of (a) $NiCo_2S_4/NF$, (b) $Fe_{1.0\%}-NiCo_2S_4/NF$, (c) $Fe_{2.5\%}-NiCo_2S_4/NF$ and (d) $Fe_{5.0\%}-NiCo_2S_4/NF$.

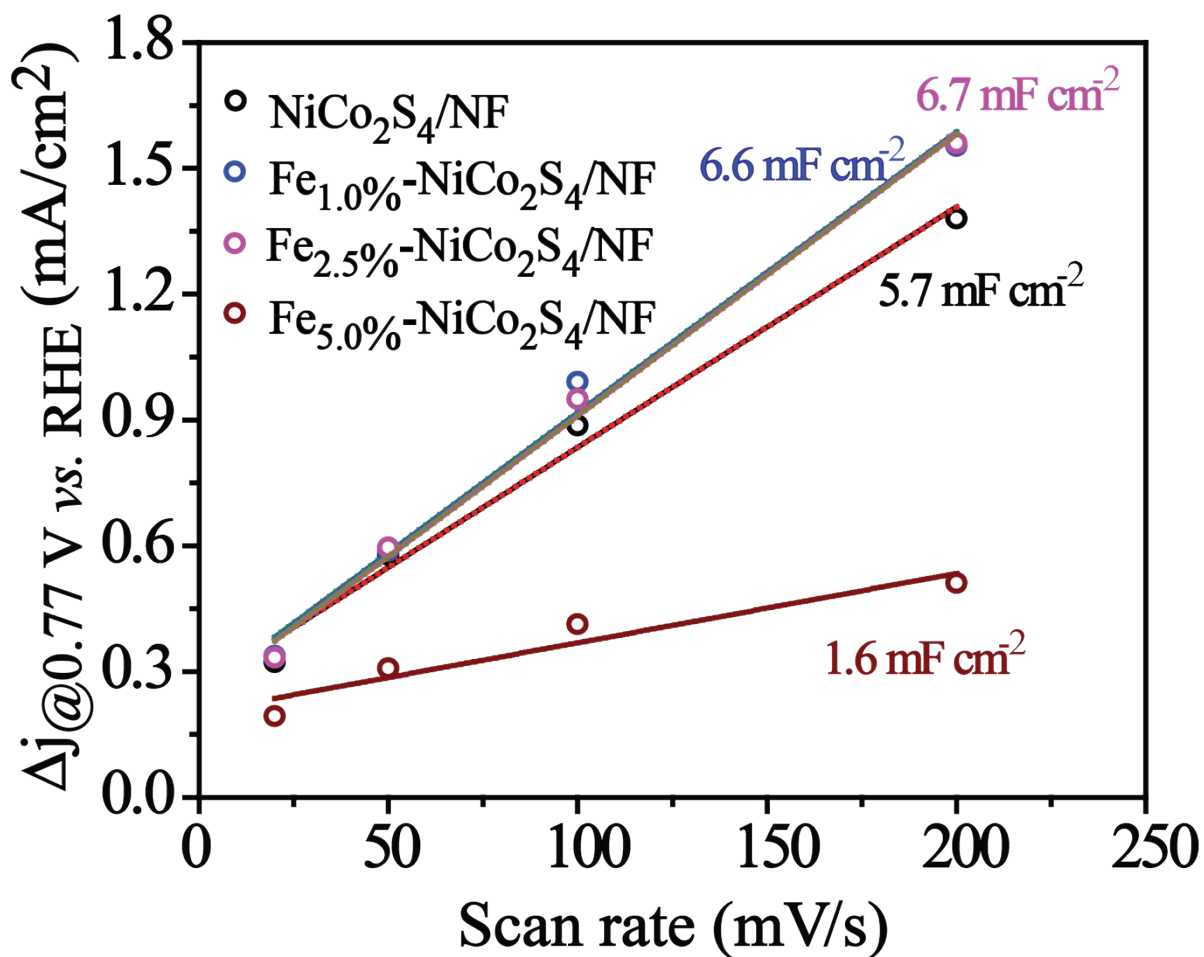


Figure S5. Plot of the anodic current against scan rate in the non-faradaic region of the CVs of (a) $\text{NiCo}_2\text{S}_4/\text{NF}$, (b) $\text{Fe}_{1.0\%}\text{-NiCo}_2\text{S}_4/\text{NF}$, (c) $\text{Fe}_{2.5\%}\text{-NiCo}_2\text{S}_4/\text{NF}$ and (d) $\text{Fe}_{5.0\%}\text{-NiCo}_2\text{S}_4/\text{NF}$.

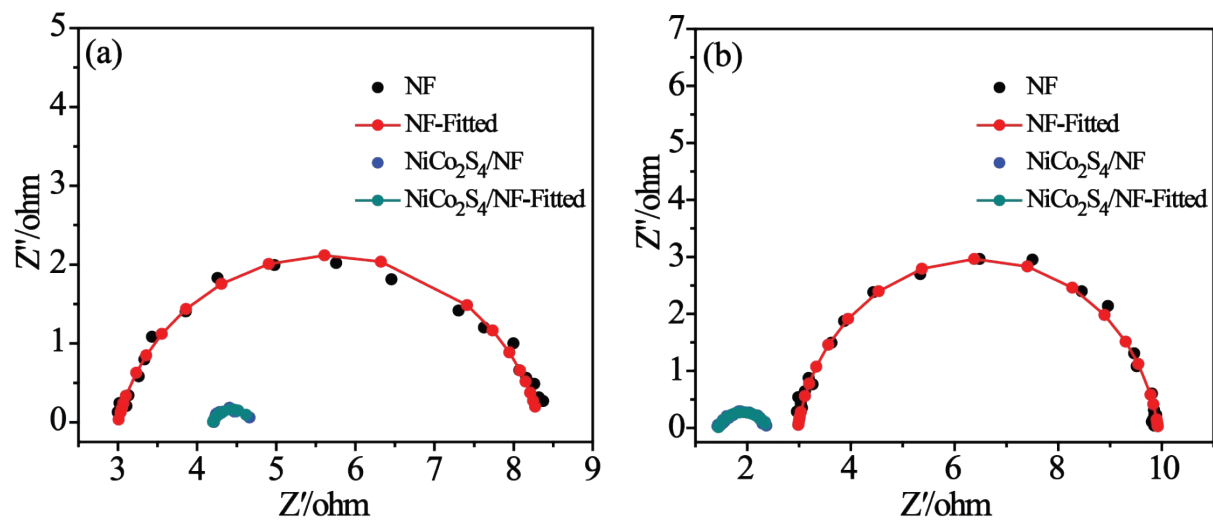


Figure S6. Nyquist plots of bare Ni-foam and $\text{NiCo}_2\text{S}_4/\text{NF}$ for (a) HER polarization (b) OER polarization.

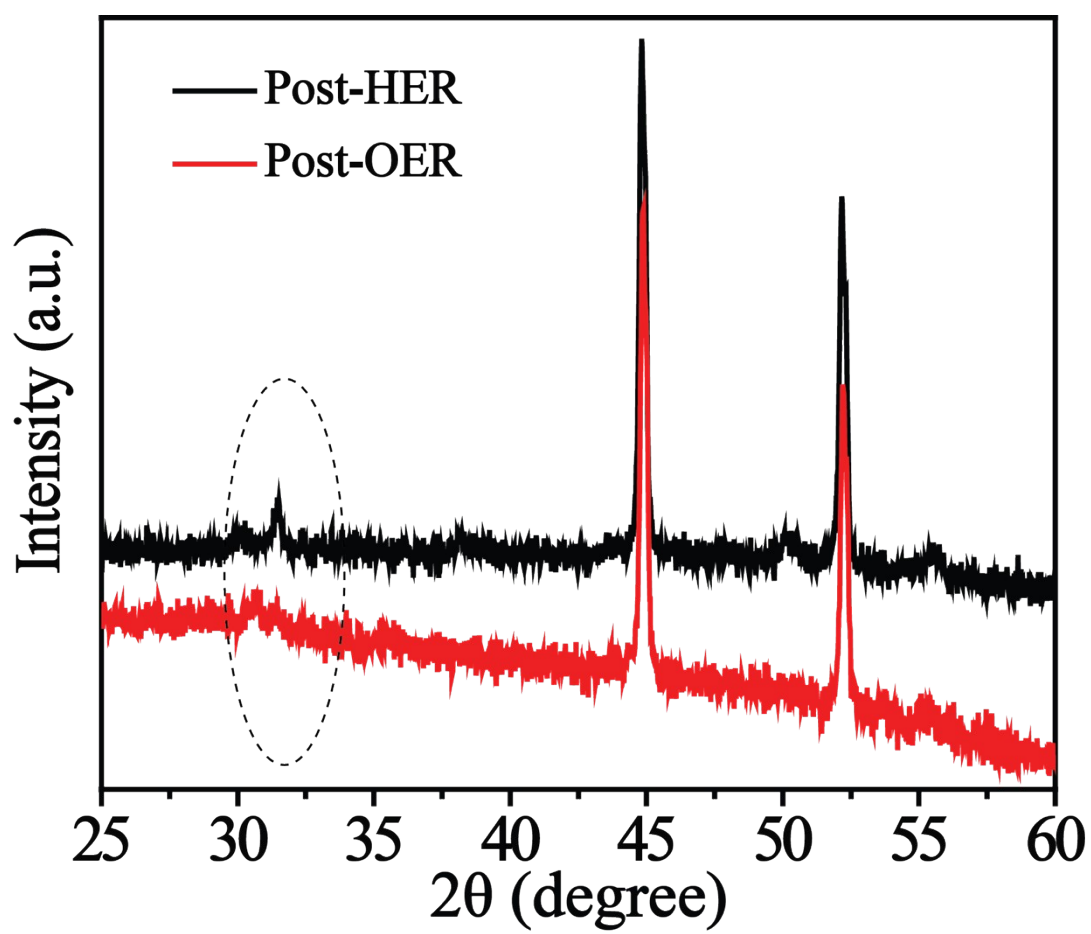


Figure S7. XRD pattern of $\text{Fe}_{2.5\%}\text{-NiCo}_2\text{S}_4/\text{NF}$ after HER and OER stability test.

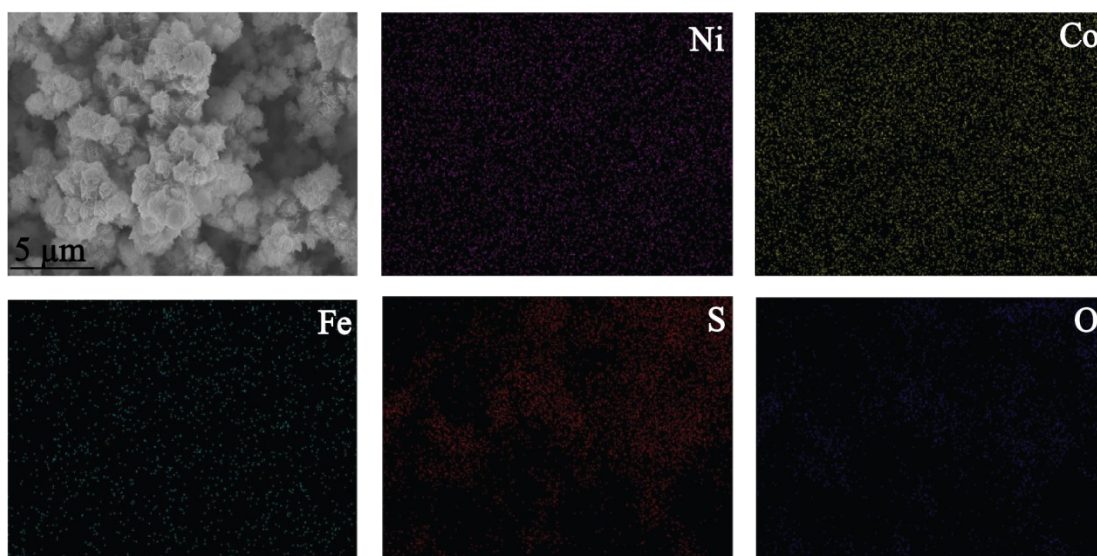
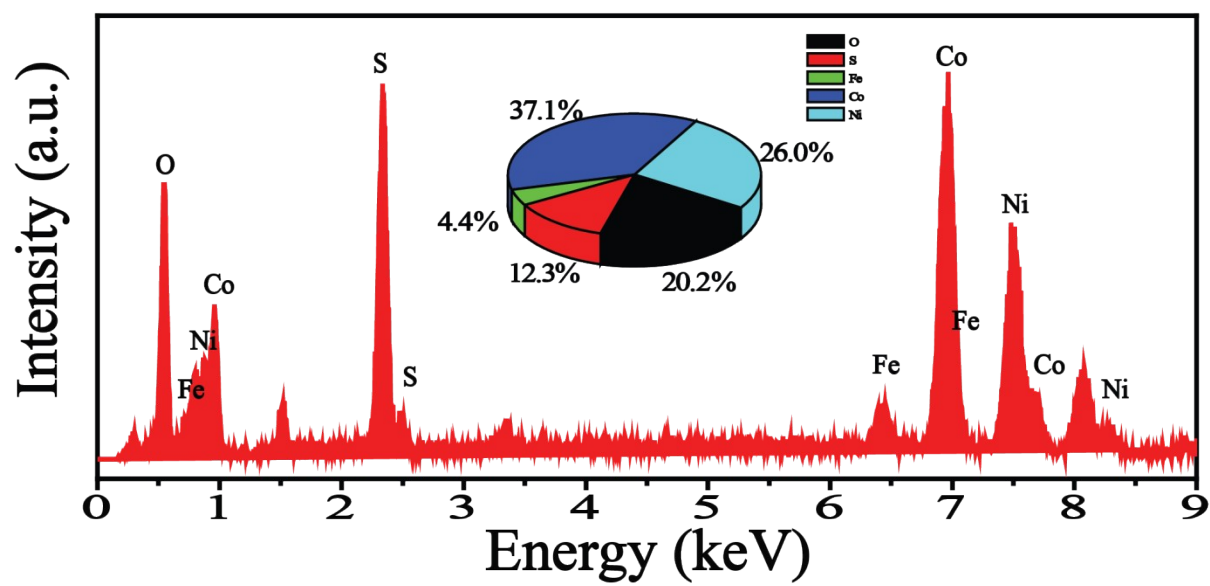


Figure S8. EDS and SEM elemental mapping of $\text{Fe}_{2.5\%}\text{-NiCo}_2\text{S}_4/\text{NF}$ after HER stability test.

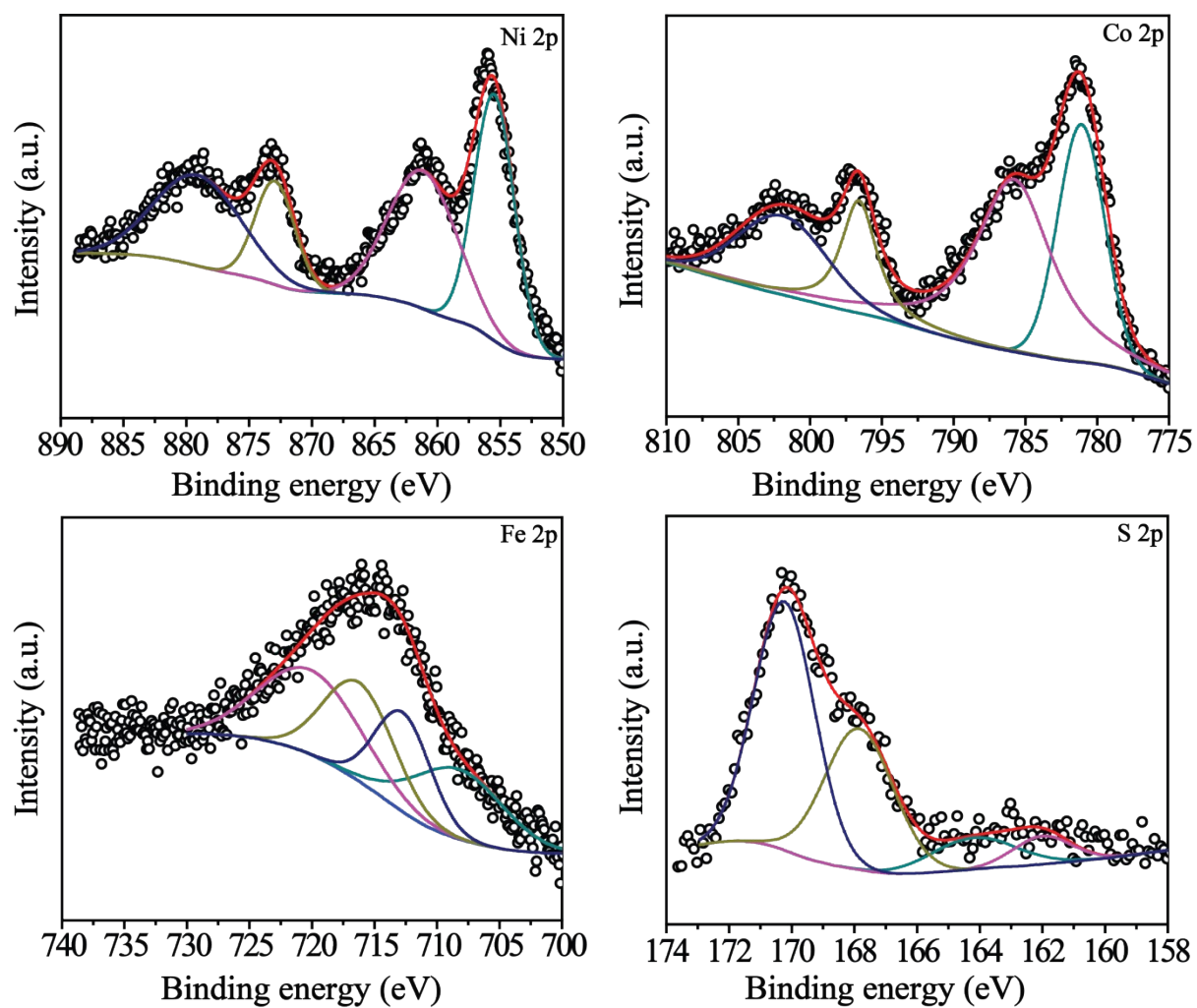


Figure S9. XPS spectrum of Ni 2p, Co 2p, Fe 2p and S 2p for Fe_{2.5%}-NiCo₂S₄/NF after HER stability test.

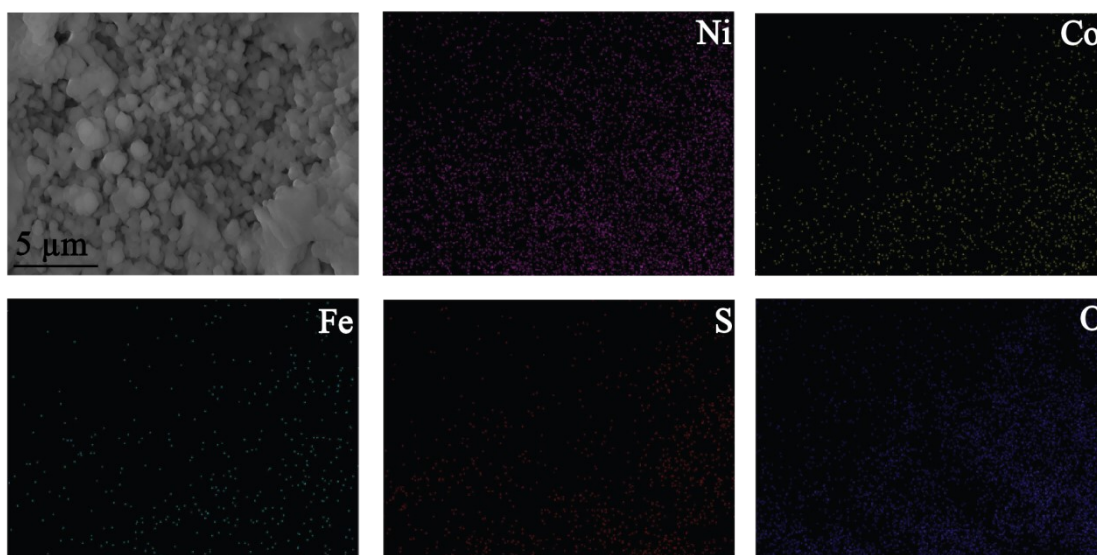
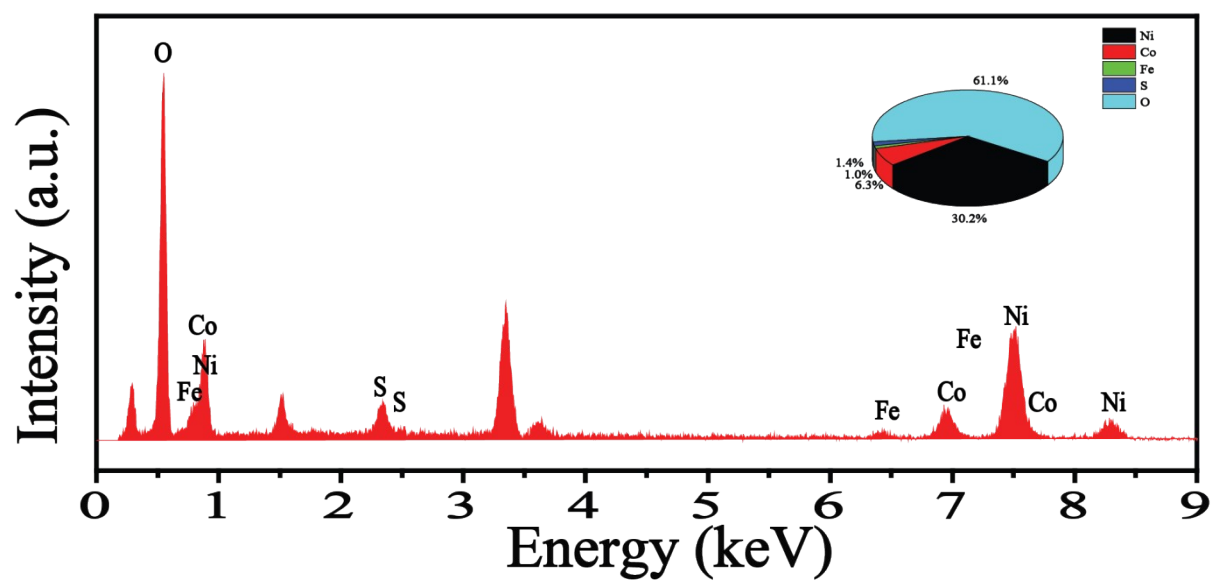


Figure S10. EDS and SEM elemental mapping of Fe_{2.5%}-NiCo₂S₄/NF after OER stability test.

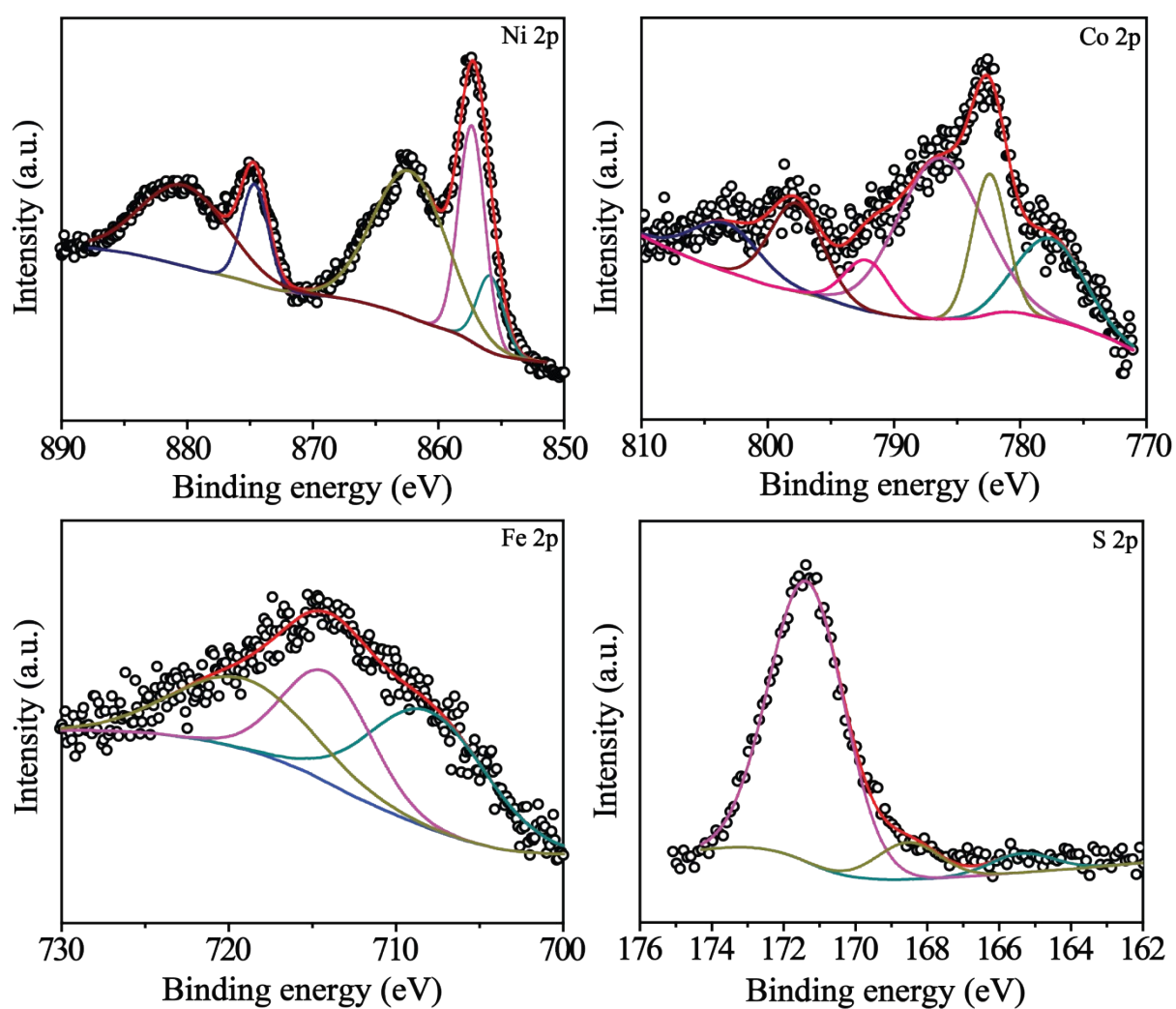


Figure S11. XPS spectrum of Ni 2p, Co 2p, Fe 2p and S 2p for Fe_{2.5%}-NiCo₂S₄/NF after OER stability test.

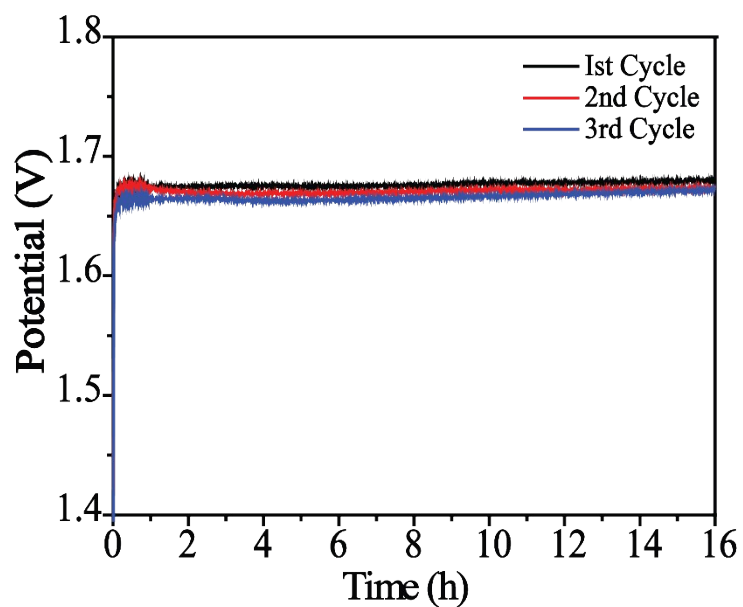


Figure S12. Three independent replicates result of Chronopotentiometric of Fe_{2.5%}-NiCo₂S₄/NF || Fe_{2.5%}-NiCo₂S₄/NF at 20 mA cm⁻².

Table S1. Elemental composition of NiCo₂S₄/NF and Fe_{2.5}%-NiCo₂S₄/NF samples.

Sample	Ni	Co	Fe	S
NiCo ₂ S ₄ /NF	30.5 wt.%	24.3 wt.%	-	8.5 wt.%
Fe _{2.5} %-NiCo ₂ S ₄ /NF	22.3 wt.%	17.1 wt.%	4.3 wt.%	8.2 wt.%