Supplementary Information

Nickel-Doped Pyrrhotite Iron Sulfide Nanosheets as Highly Efficient Electrocatalysts for Water Splitting

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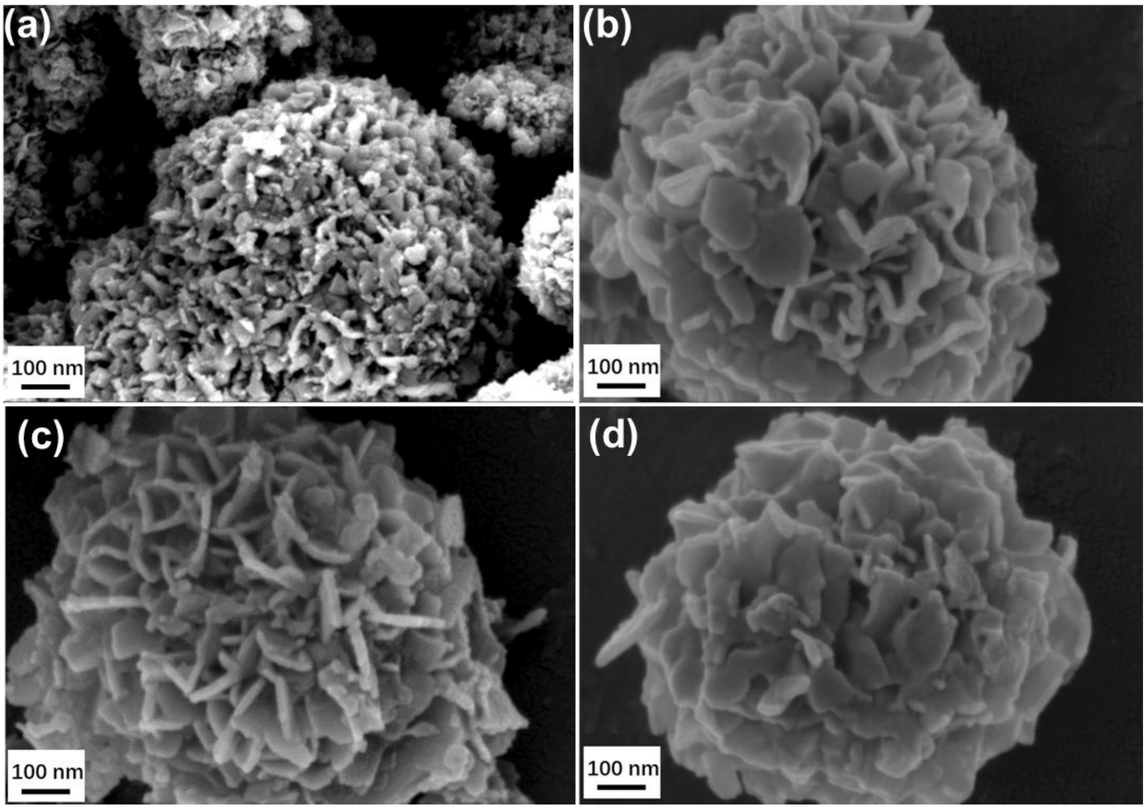
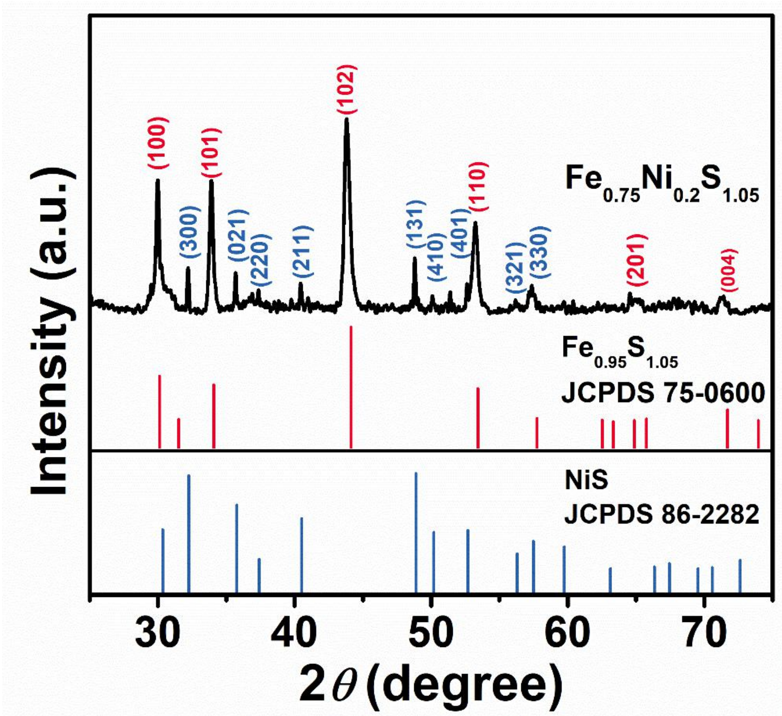


Figuer S1 SEM image of (a) $Fe_{0.95}S_{1.05}$ (b) $Fe_{0.9}Ni_{0.05}S_{1.05}$ (c) $Fe_{0.85}Ni_{0.1}S_{1.05}$ (d) $Fe_{0.75}Ni_{0.2}S_{1.05}$.



Figures S2 XRD pattern of $Fe_{0.75}Ni_{0.2}S_{1.05}$.

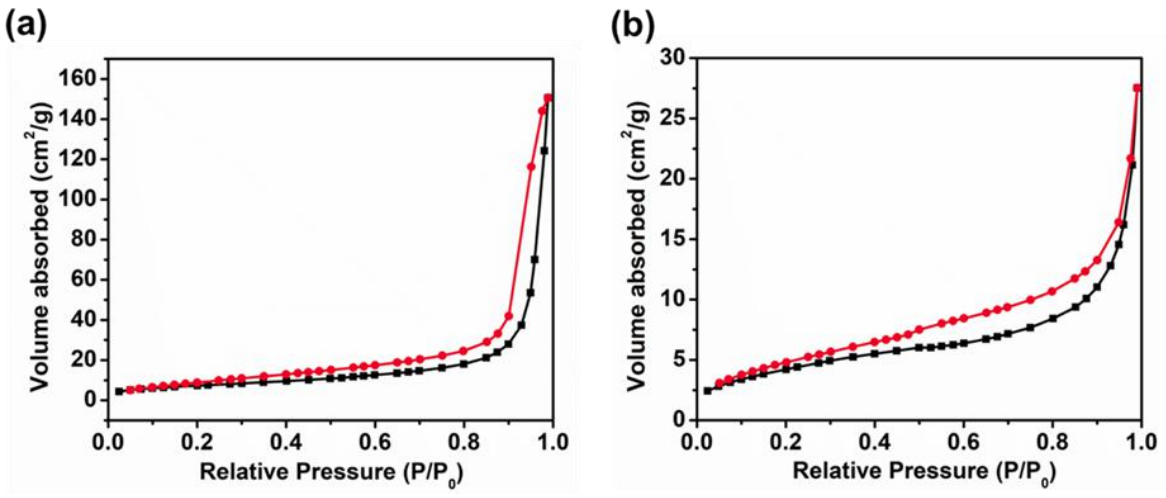


Figure S3 Nitrogen isotherm and pore size distribution of (a) $Fe_{0.95}S_{1.05}$ and (b) $Fe_{0.8}Ni_{0.15}S_{1.05}$ catalysts

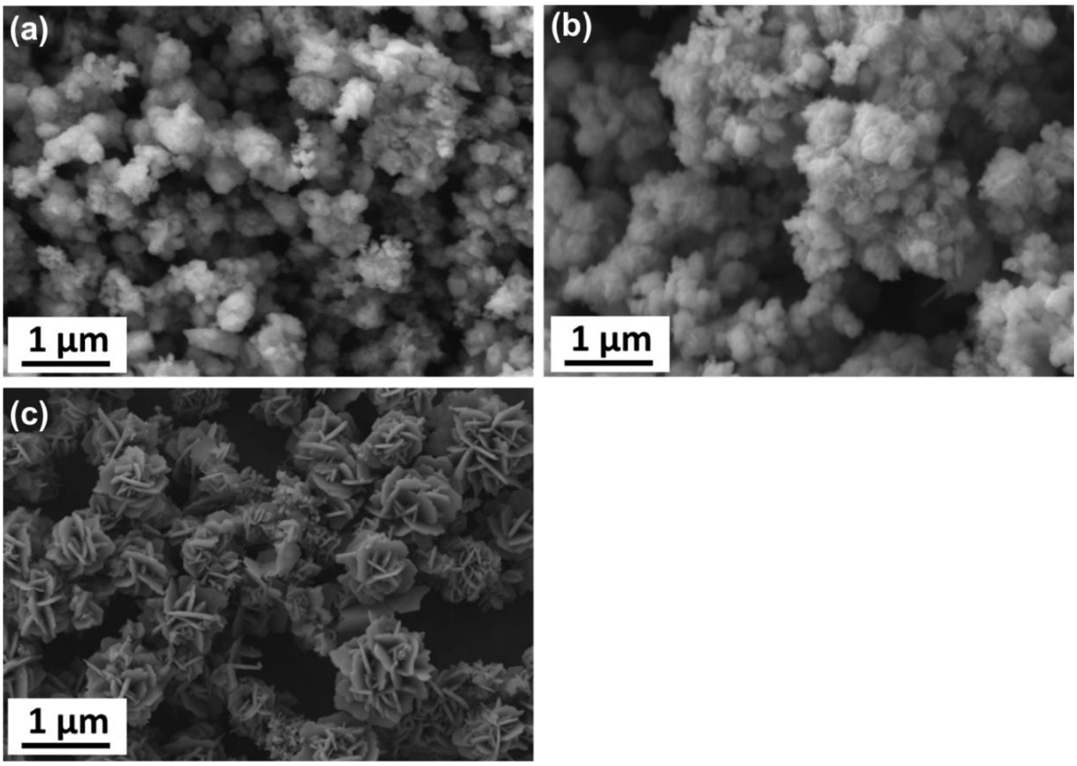


Figure S4 SEM images of the $Fe_{0.8}Ni_{0.15}S_{1.05}$ products synthesized at various reaction temperatures, (a) 150 °C, (b) 180 °C, (c) 210 °C for 16 h.

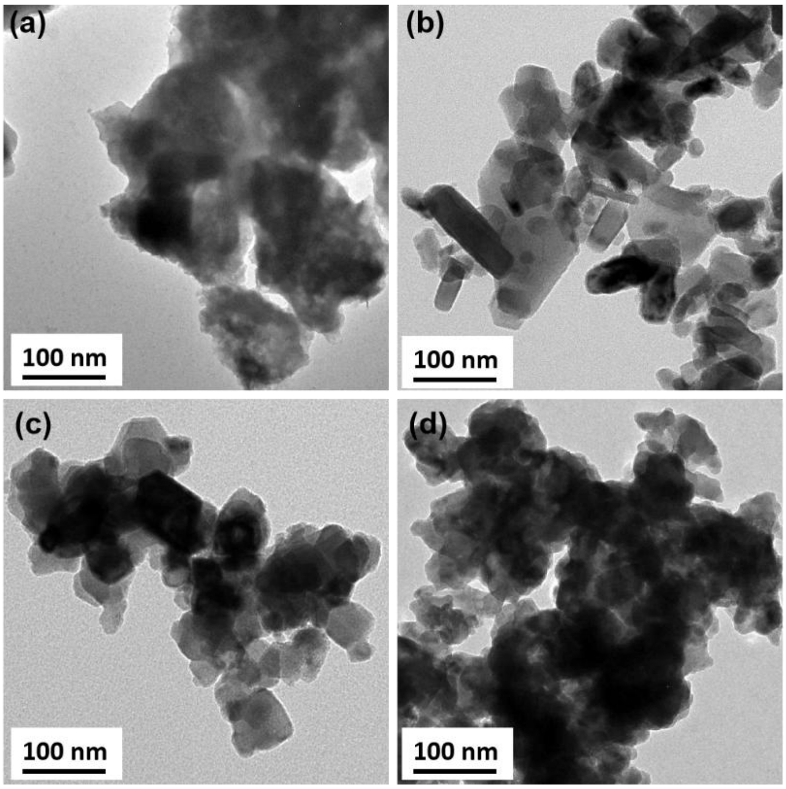
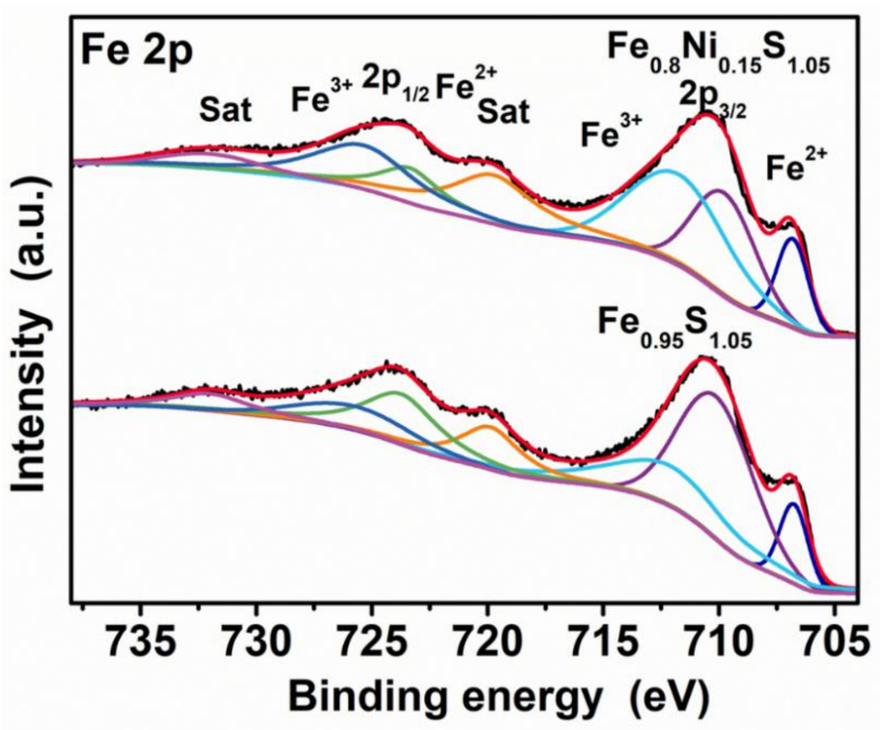
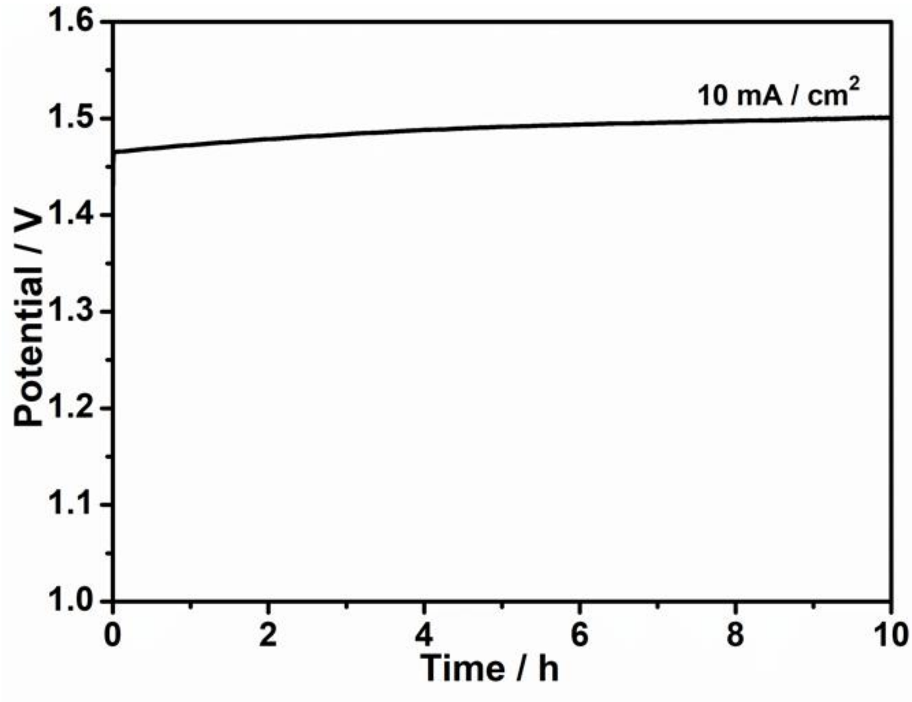


Figure S5 TEM images of as-prepared products obtained via hydrothermal reaction after (a) 1 h, (b) 5 h, (c) 10 h and (d) 15 h



Figuer S6 Fe 2p and high-resolution XPS of $Fe_{0.8}Ni_{0.15}S_{1.05}$ catalyst and $Fe_{0.95}S_{1.05}$.



Figuer S7 *E-t* curves of $Fe_{0.8}Ni_{0.15}S_{1.05}$ at a potential of 1.47 V for 10 h.

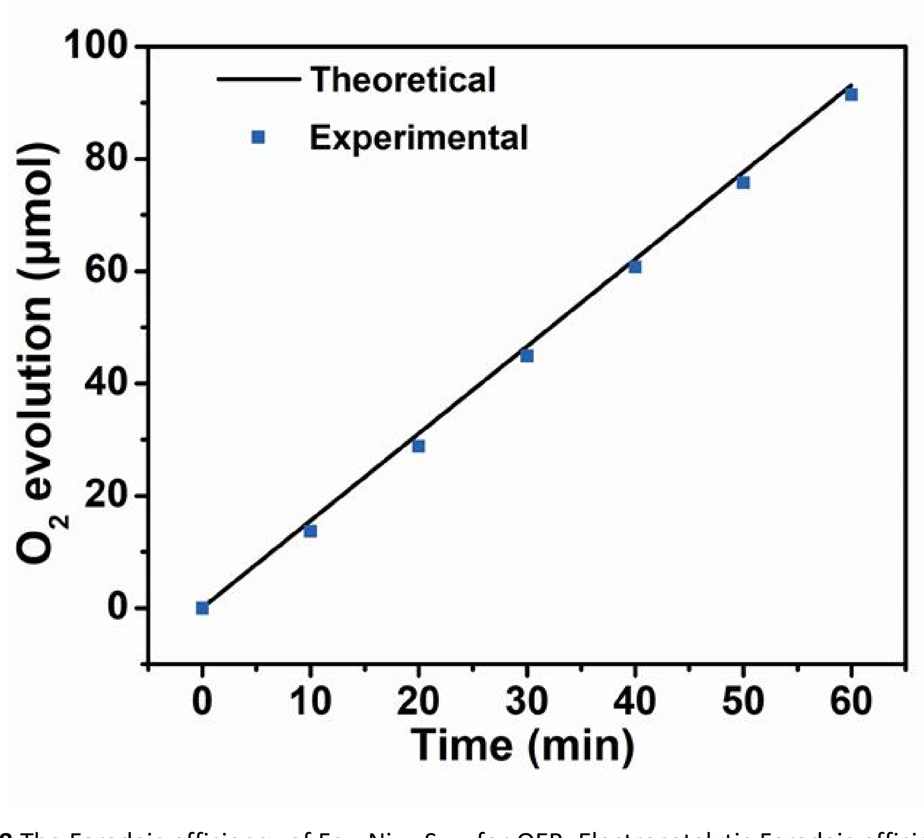
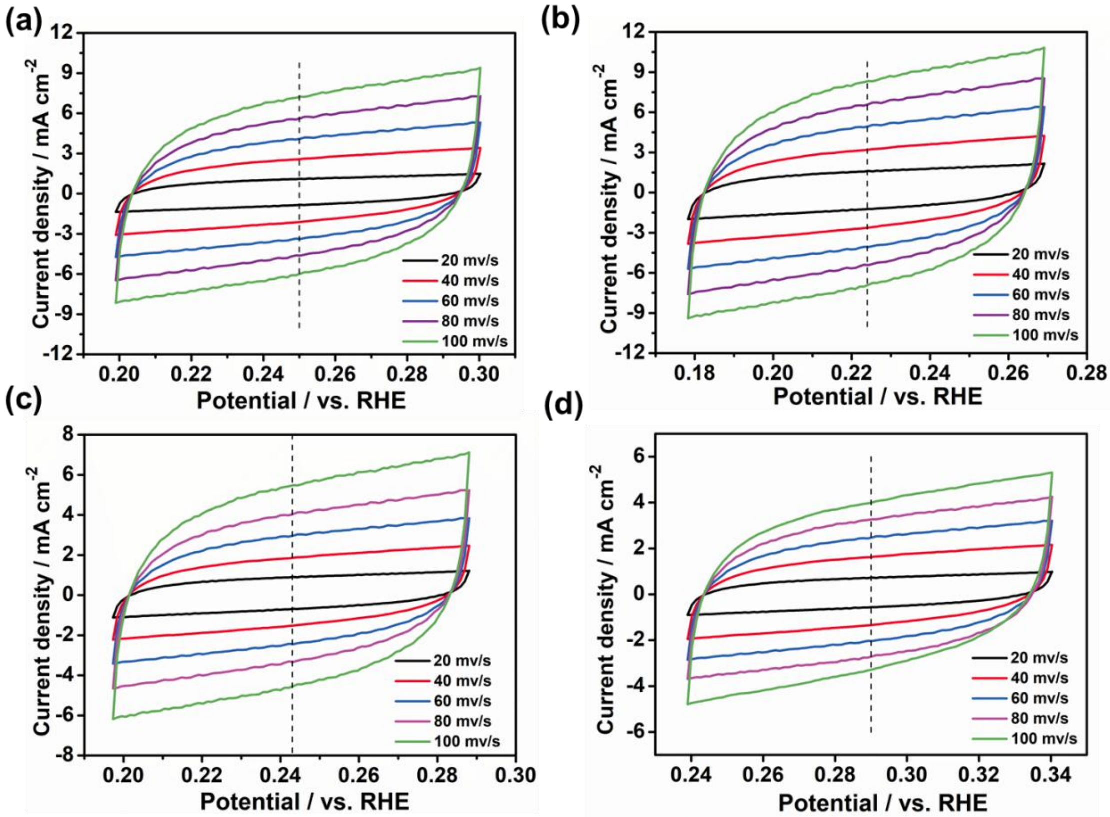


Figure S8 The Faradaic efficiency of $Fe_{0.8}Ni_{0.15}S_{1.05}$ for OER. Electrocatalytic Faradaic efficiencies of OER over $Fe_{0.8}Ni_{0.15}S_{1.05}$ at a current density of 10 $mA \cdot cm^{-2}$ measured for 60 min.



Figuer S9 CV curves in a potential window of 200−300 mV of (a)$Fe_{0.75}Ni_{0.20}S_{1.05}$, (b) $Fe_{0.8}Ni_{0.15}S_{1.05}$, (c) $Fe_{0.85}Ni_{0.1}S_{1.05}$ and (d) $Fe_{0.9}Ni_{0.05}S_{1.05}$ electrode.

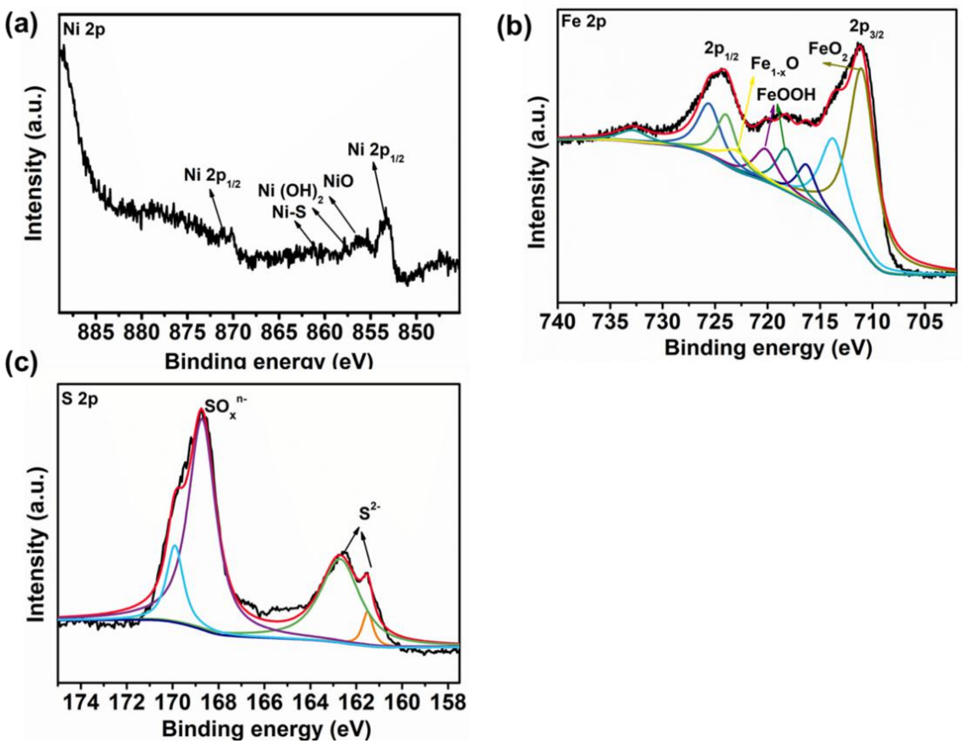


Figure S10 (a) Ni 2p, (b) Fe 2p and (c) S 2p high-resolution XPS of $Fe_{0.8}Ni_{0.15}S_{1.05}$ catalyst after OER test.

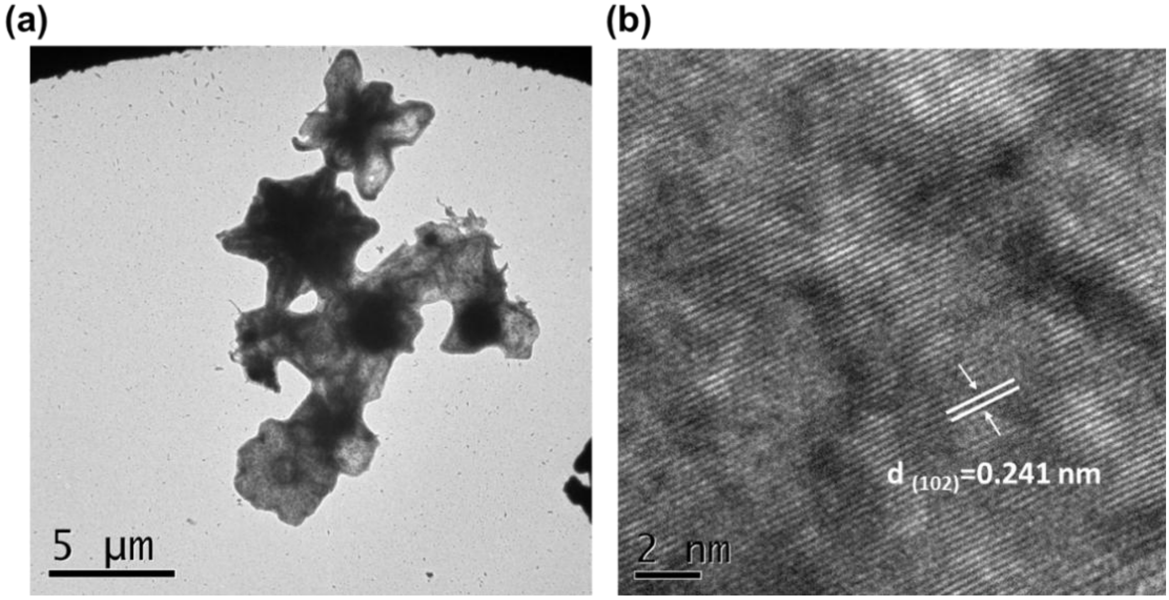


Figure S11 TEM images of $Fe_{0.8}Ni_{0.15}S_{1.05}$ catalyst after OER test.

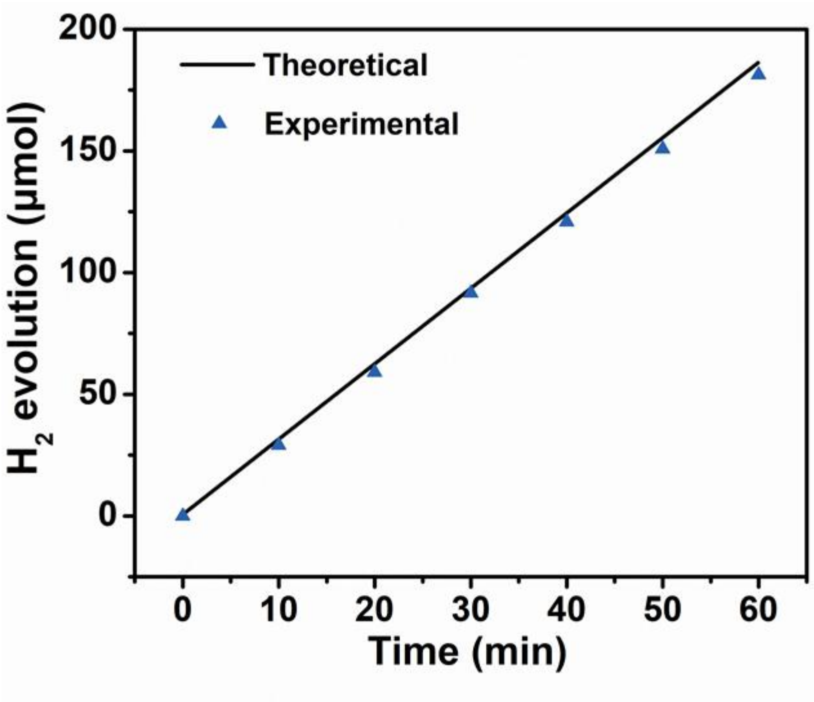
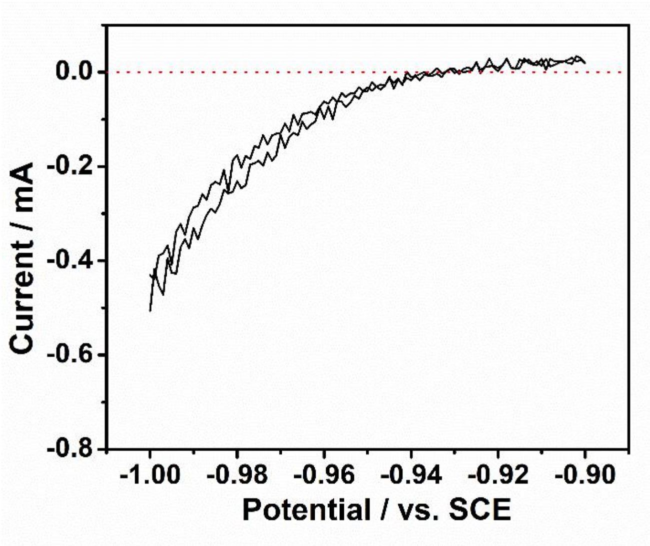


Figure S12 The Faradaic efficiency of $Fe_{0.8}Ni_{0.15}S_{1.05}$ for HER. Electrocatalytic Faradaic efficiencies of HER over $Fe_{0.8}Ni_{0.15}S_{1.05}$ at a current density of 10 mA·cm^{-2} measured for 60 min.



RHE calibration

In all electrochemical tests, we use Hg/HgO electrode as the reference electrode. The calibration was performed using a Platinum wire as the working electrode in 1 M KOH solutions under H_2-saturated condition. The CV curves were test in 1.0 mol/L (M) KOH at a scan rate of 1 mV/s. The average value of the two potentials when the current crosses zero is used as the thermodynamic potential of the hydrogen electrode reaction.

$$E_{RHE} = E_{Hg/HgO} + 0.928$$

Table S1

ICP results for $Fe_{0.95-x}Ni_xS_{1.05}$ catalysts.

	Fe	Ni	S
lin bk	< 0.00011	< -0.00059	< -0.00639
$Fe_{0.95}S_{1.05}$	1.2666	< -0.00077	1.4132
$Fe_{0.9}Ni_{0.05}S_{1.05}$	1.2131	0.0711	1.4666
$Fe_{0.85}Ni_{0.1}S_{1.05}$	1.1343	0.1346	1.4936
$Fe_{0.8}Ni_{0.15}S_{1.05}$	1.0785	0.2113	1.4864
$Fe_{0.75}Ni_{0.2}S_{1.05}$	1.0132	0.2438	1.4568

Table S2

The R_{ct} value of $Fe_{0.95-x}Ni_xS_{1.05}$ catalysts.

Catalysts	R_{ct} (Ω)
$Fe_{0.95}S_{1.05}$	22.5
$Fe_{0.9}Ni_{0.05}S_{1.05}$	4.593
$Fe_{0.85}Ni_{0.1}S_{1.05}$	5.293
$Fe_{0.8}Ni_{0.15}S_{1.05}$	1.553
$Fe_{0.75}Ni_{0.2}S_{1.05}$	3.909

References

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