

Supplementary information

Composition- and Structure-tunable CoNiFe Hydroxide Nanostructures toward Enhanced Oxygen Evolution Reaction

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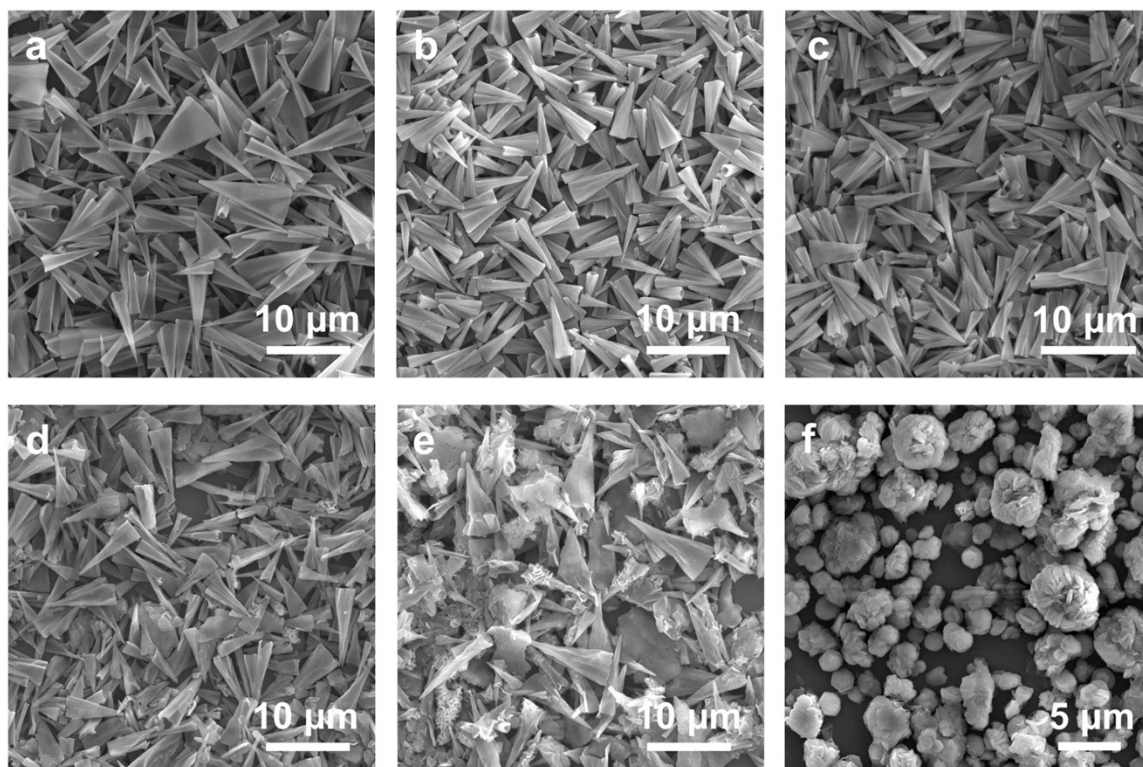


Figure S1. SEM images of (a) $\text{Co}(\text{OH})_2$, (b) Co_4Ni_1 hydroxide, (c) Co_3Ni_1 hydroxide, (d) Co_2Ni_1 hydroxide, (e) Co_1Ni_1 hydroxide, (f) $\text{Ni}(\text{OH})_2$.

Table S1. EDS results of CoNi hydroxide with different CoNi ratio (atomic %).

Designed ratio	Actual ratio	Co	Ni
4:1	4.1:1	32.3	7.9
3:1	3.0:1	26.3	8.9
2:1	1.9:1	18.8	9.7
1:1	1.0:1	15.3	15.9

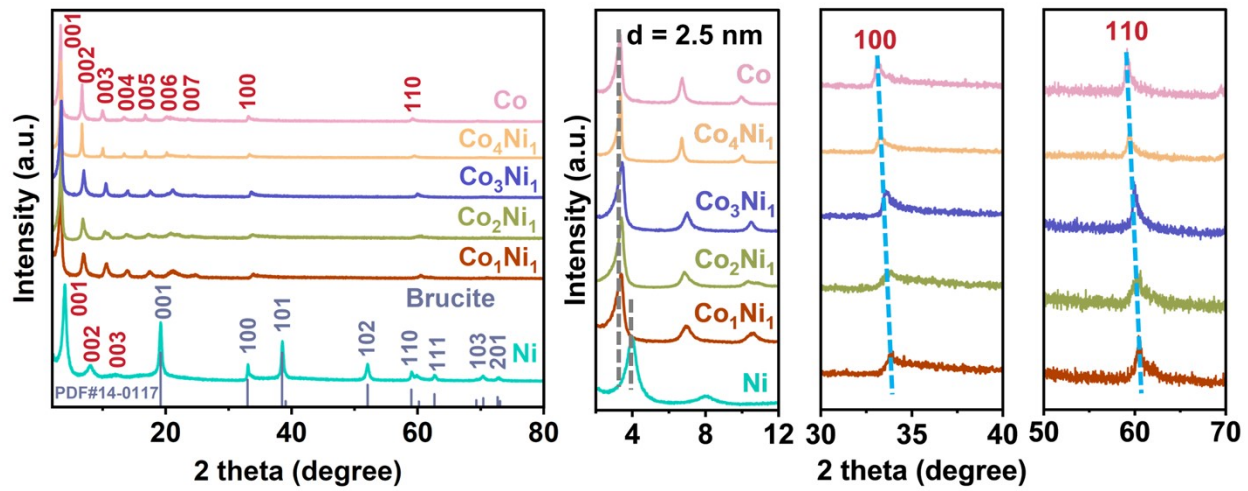


Figure S2. XRD patterns of $\text{Co}(\text{OH})_2$, Co_4Ni_1 hydroxide, Co_3Ni_1 hydroxide, Co_2Ni_1 hydroxide, Co_1Ni_1 hydroxide, and $\text{Ni}(\text{OH})_2$.

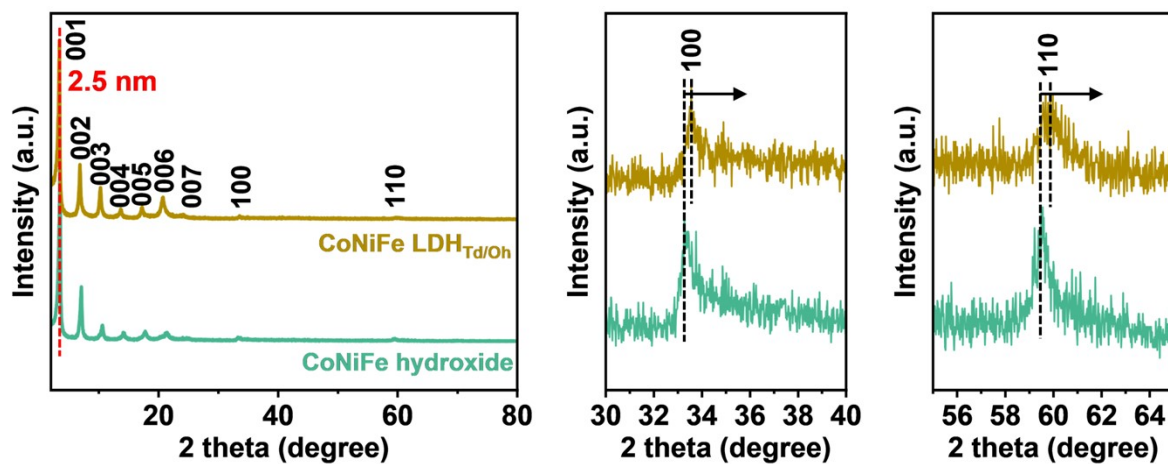


Figure S3. XRD patterns of $\text{Co}_3\text{Ni}_1\text{Fe}_1$ hydroxide nanocones and $\text{Co}_3\text{Ni}_1\text{Fe}_1$ $\text{LDH}_{\text{Td/Oh}}$ nanocones.

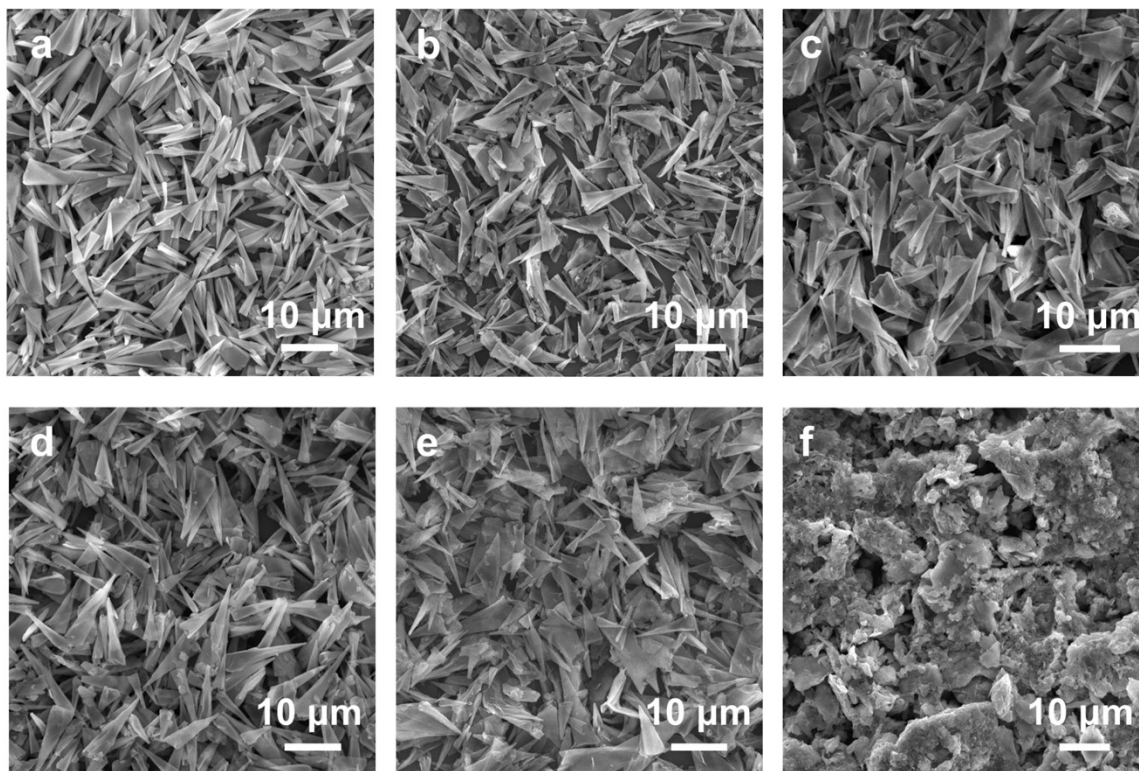


Figure S4. SEM images of CoNiFe LDH_{Td/Oh} with different metal ratios: (a) Co₈Ni₁Fe₁, (b) Co₇Ni₂Fe₁, (c) Co₇Ni₂Fe₂, (d) Co₃Ni₁Fe₁, (e) Co₇Ni₁Fe₂, and (f) Co₆Ni₁Fe₃.

Table S2. EDS results of Fe-doped CoNi LDH_{Td/Oh} with different CoNiFe ratio (atomic %).

Designed ratio	Actual ratio	Co	Ni	Fe
8:1:1	0.85: 0.10: 0.05	30.2	3.5	1.7
7:2:1	0.75: 0.21: 0.04	20.9	6.1	1.1
7:2:2	0.72: 0.18: 0.10	24.6	6.0	3.2
3:1:1	0.68: 0.23: 0.09	23.9	8.3	3.3
7:1:2	0.81: 0.09: 0.10	22.3	2.4	2.8
6:1:3	0.65: 0.11: 0.24	24.6	4.2	8.9

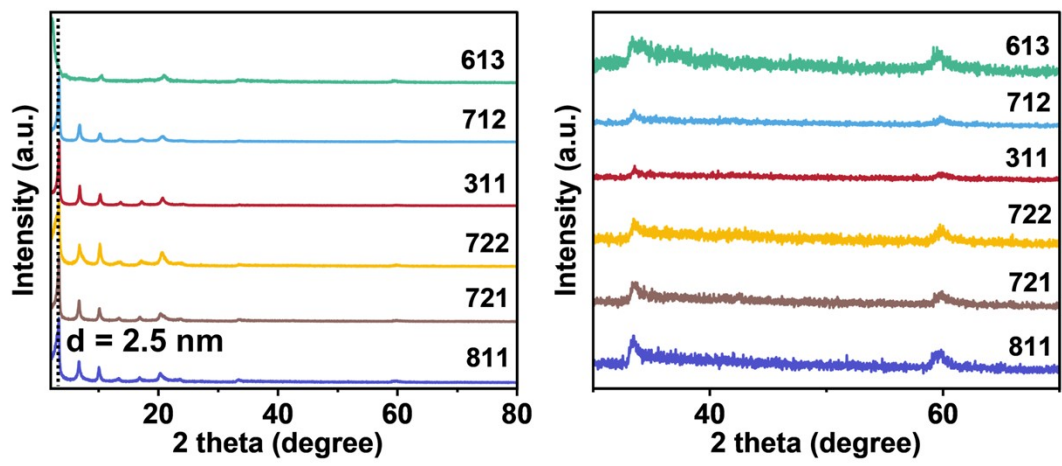


Figure S5. XRD patterns of CoNiFe LDH_{Td/Oh} with different CoNiFe ratios.

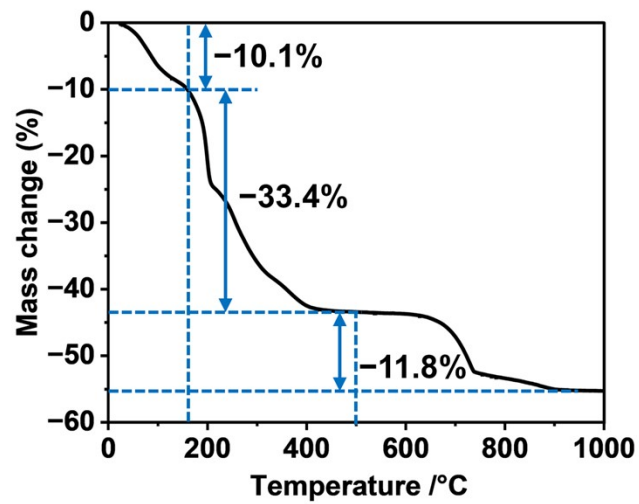


Figure S6. TG curve of LDH_{Td/Oh} nanocones with a designed CoNiFe ratio of 3:1:1.

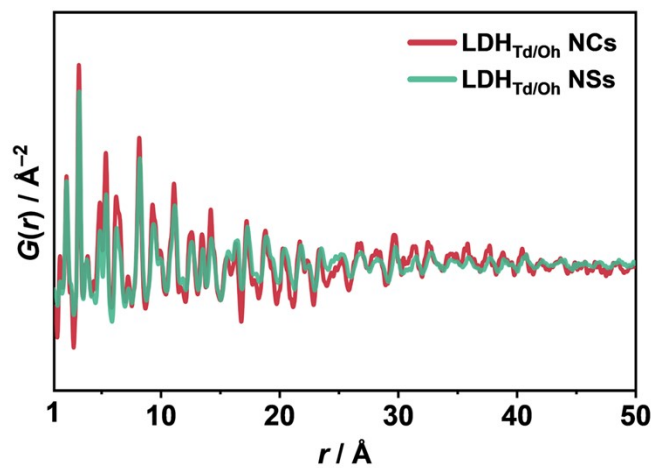


Figure S7. PDF patterns of CoNiFe LDH_{Td/Oh} nanocones and nanosheets for high- r range.

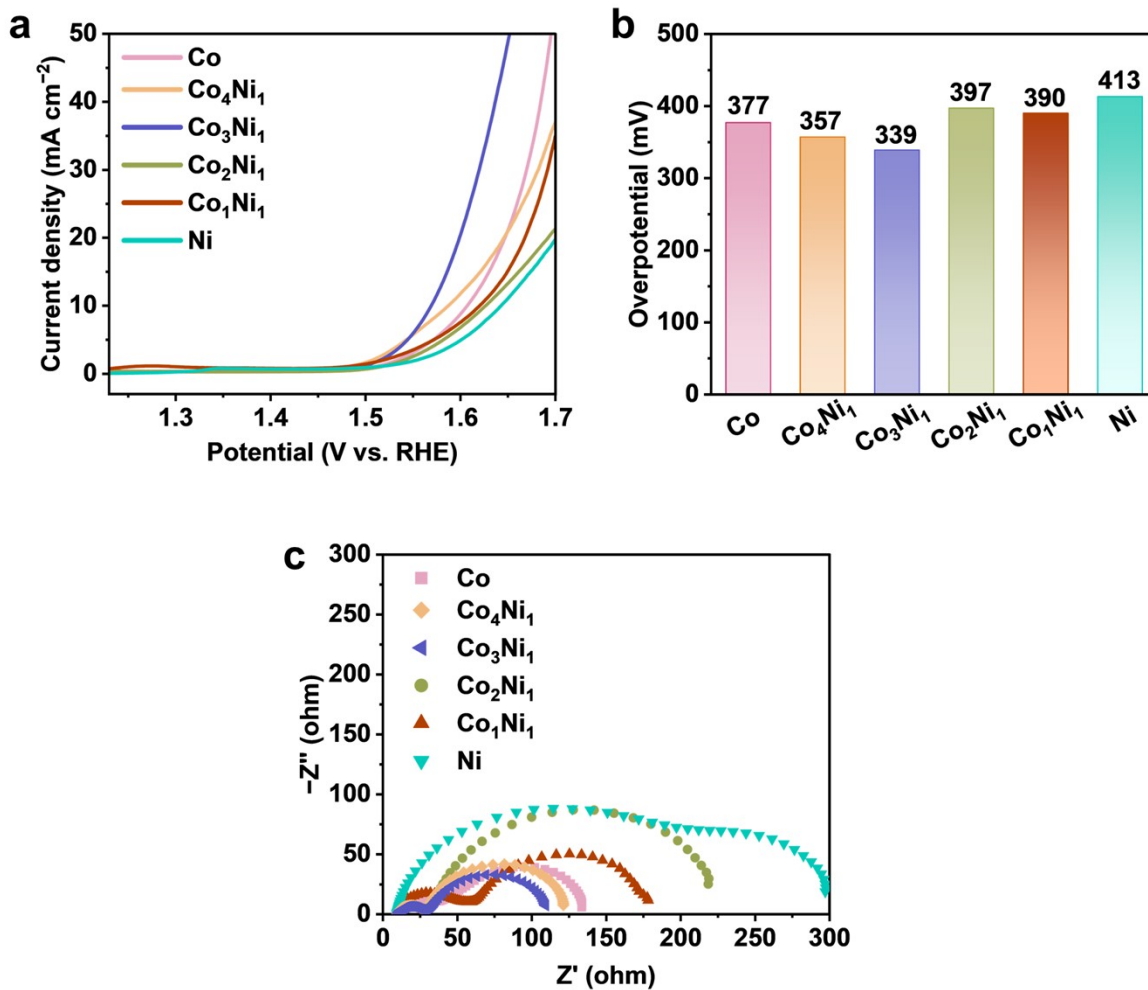


Figure S8. OER performance of CoNi hydroxide nanocones: (a) LSV curves, (b) overpotentials, and (c) Nyquist plots.

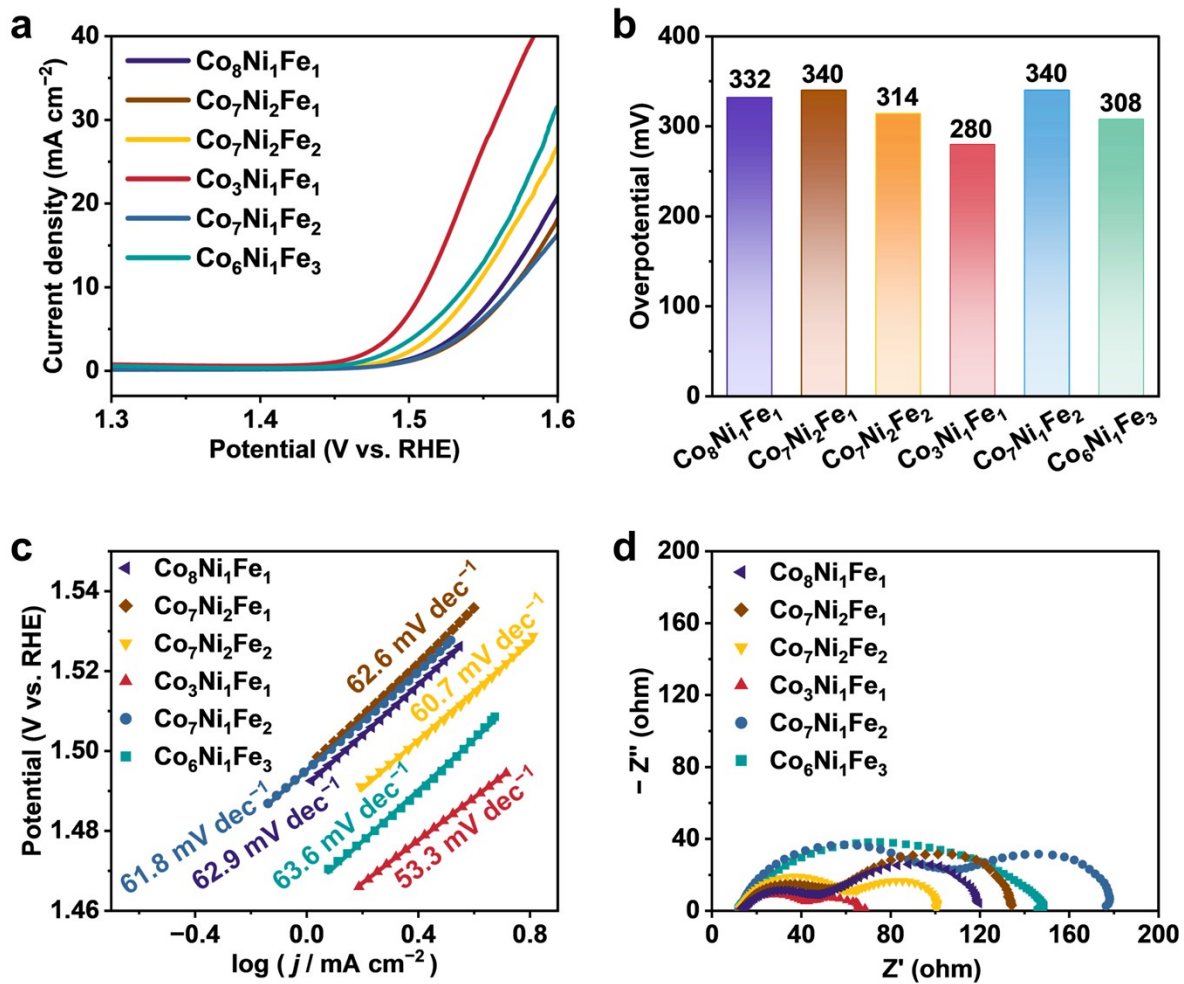


Figure S9. OER performance of CoNiFe LDH_{Td/Oh} nanocones: (a) LSV curves, (b) overpotentials, (c) Tafel plots, and (d) Nyquist plots.

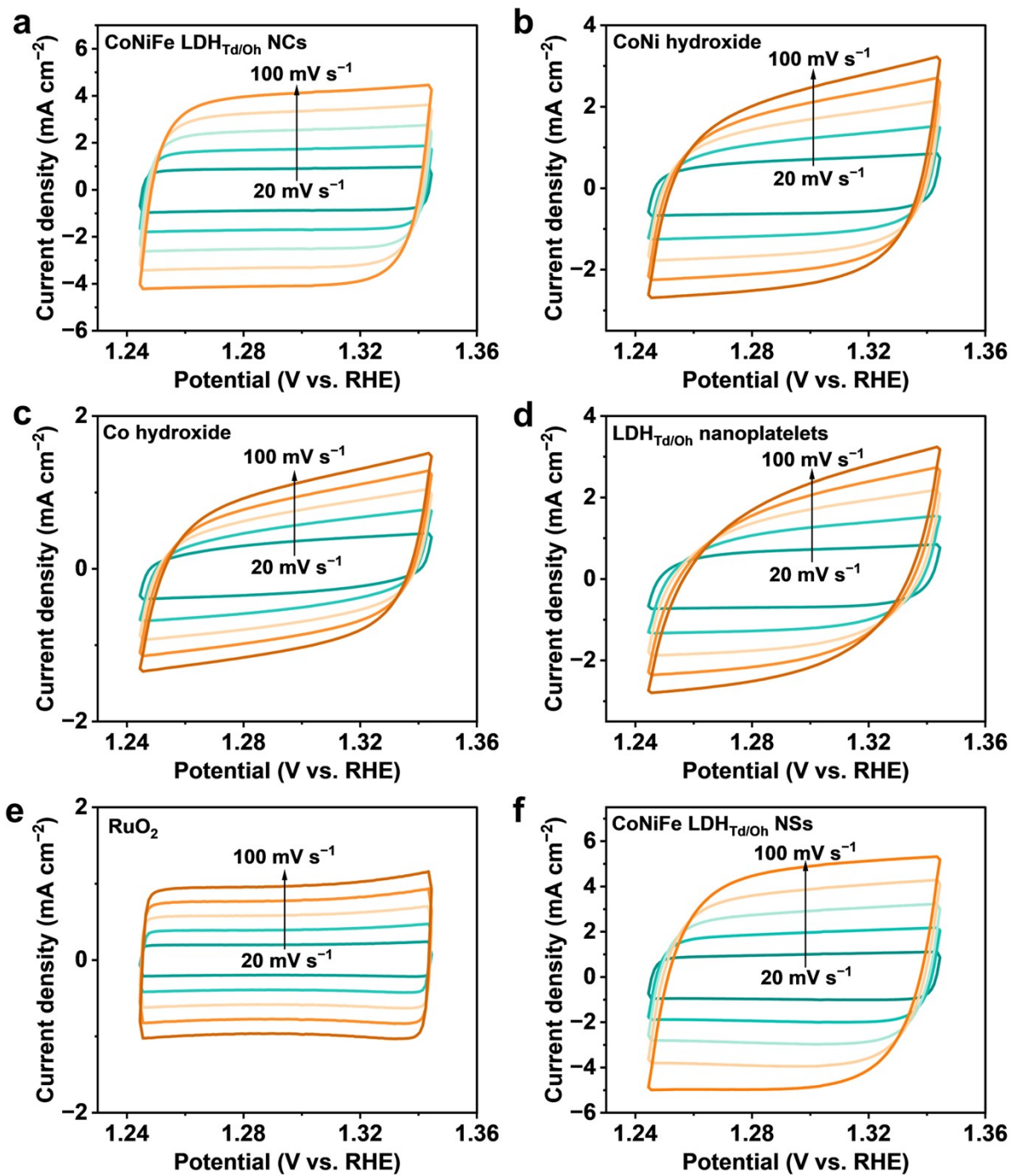


Figure S10. CV tests at different scan rates in a non-faradaic range to calculate the ECSA for (a) CoNiFe LDH_{Td/Oh} NCs, (b) CoNi hydroxide NCs, (c) Co hydroxide NCs, (d) CoNiFe LDH_{Td/Oh} nanoplatelets, (e) RuO₂, and (f) CoNiFe LDH_{Td/Oh} NSs.

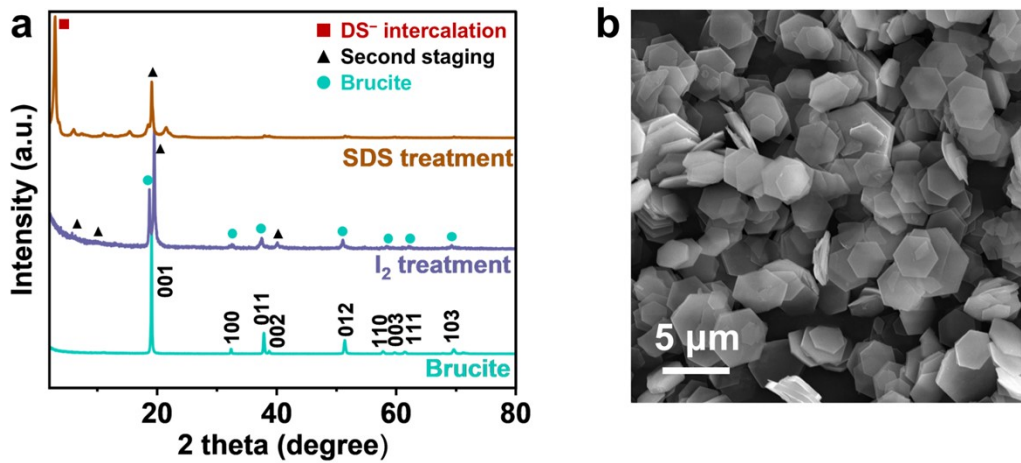


Figure S11. (a) XRD patterns of CoNiFe hydroxide nanoplatelets. (b) SEM image of CoNiFe LDH nanoplatelets with DS⁻ intercalation.

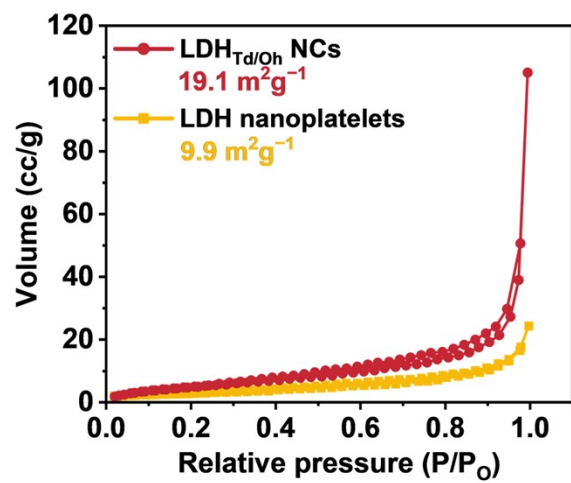


Figure S12. N₂ adsorption-desorption isotherms of CoNiFe LDH_{Td/Oh} NCs and CoNiFe LDH nanoplatelets.

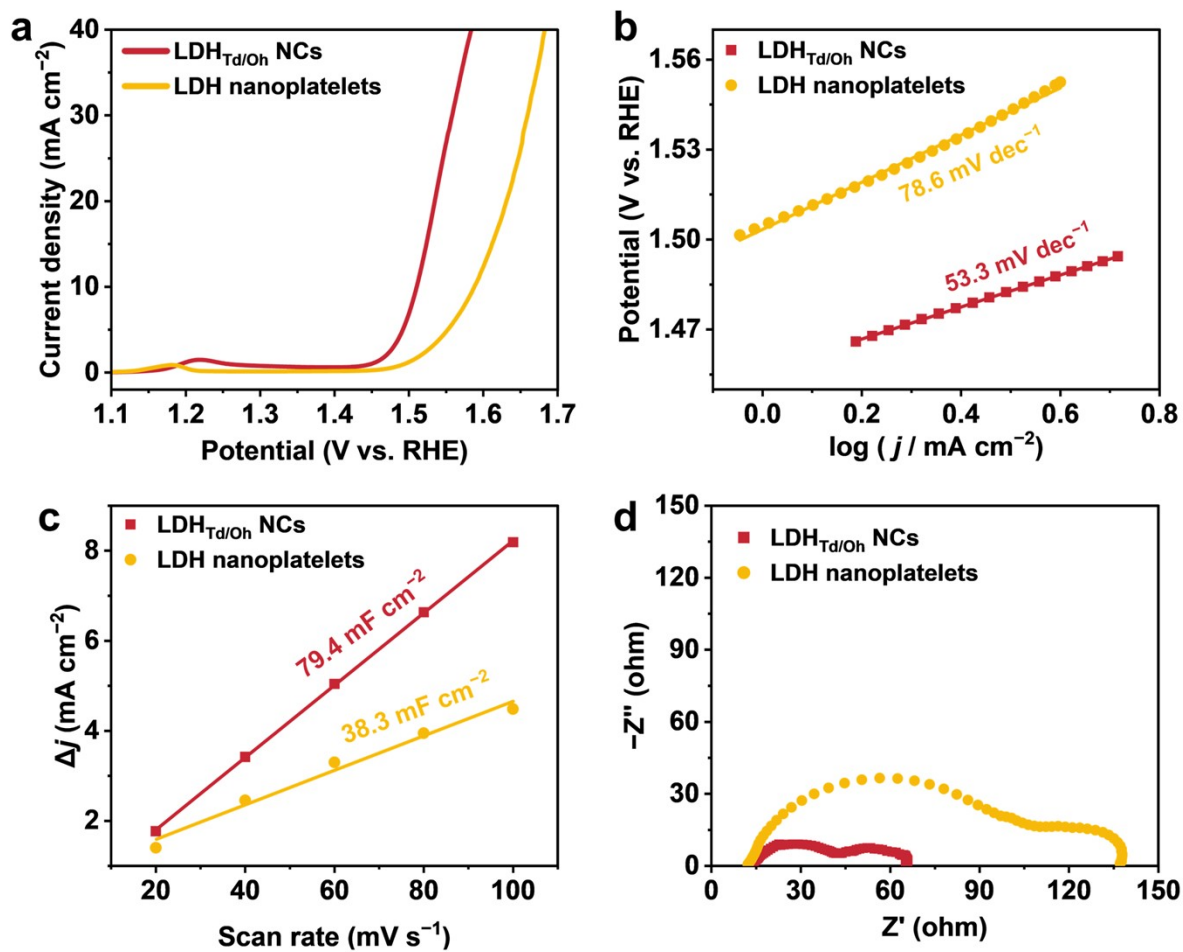


Figure S13. OER performance of CoNiFe LDH_{Td/Oh} nanocones and CoNiFe LDH nanoplatelets: (a) LSV curves, (b) Tafel plots, (c) current density differences versus scan rates measured in non-faradaic range, and (d) Nyquist plots.

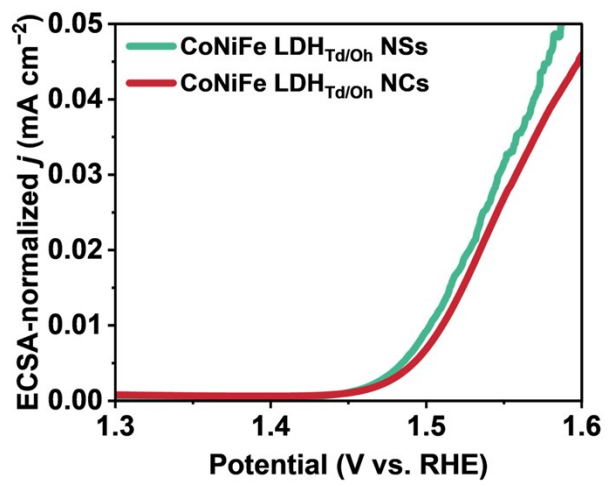


Figure S14. ECSA-normalized LSV curves of CoNiFe LDH_{Td/Oh} NSs and CoNiFe LDH_{Td/Oh} NCs.

Table S3. Comparison of OER performance of CoNiFe LDH_{Td/Oh} NCs and recently reported non-precious OER catalysts in 1 M KOH.

Electrocatalyst	η_{10} (mV)	Tafel slope (mV dec ⁻¹)	Stability (h)	Reference
CoNiFe LDH_{Td/Oh} NCs	280 (267 for NSs)	53.3	40	This work
CoCo LDH	393	59	12	1
NiFe-LDH/SnS	310	53.6	-	2
S-Ni ₇ Fe ₃ LDH/TGF	290	87.84	11	3
FeCo/LDH-NGCP	299.6	79.21	-	4
Co/NBC	302	70	11	5
CoP/NCNHP	310	70	36	6
Co _{1.8} Ni-LDH	290	66	40	7
0.5NFLC	264	67.8	50	8
CoO/NiFe LDH	290	107	30	9
NiFe(CN) ₅ NO	360	122	30	10
Ni(OH) ₂ /GO	380	89.1	12	11
NiFe (oxy)hydroxide	268	53.6	28	12
NiFeCuS	327	82.5	-	13
NiCo@mpNC	278	95.2	20	14

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