Electronic Supplementary Material (ESI) for RSC Advances.

Controlled synthesis of trimetallic nitrogen-incorporated CoNiFe layered double hydroxide electrocatalysts for boosting oxygen evolution reaction

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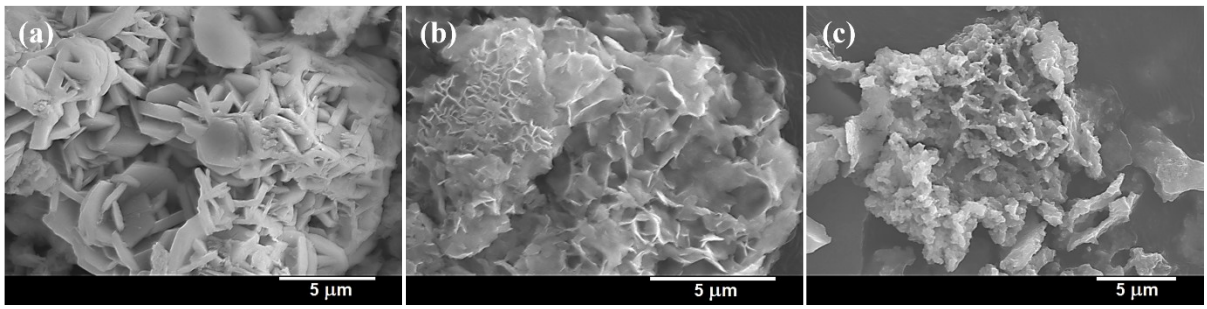

Figure S1. SEM images of monometallic (a) N-Co, (b) N-Ni, and (c) N-Fe.

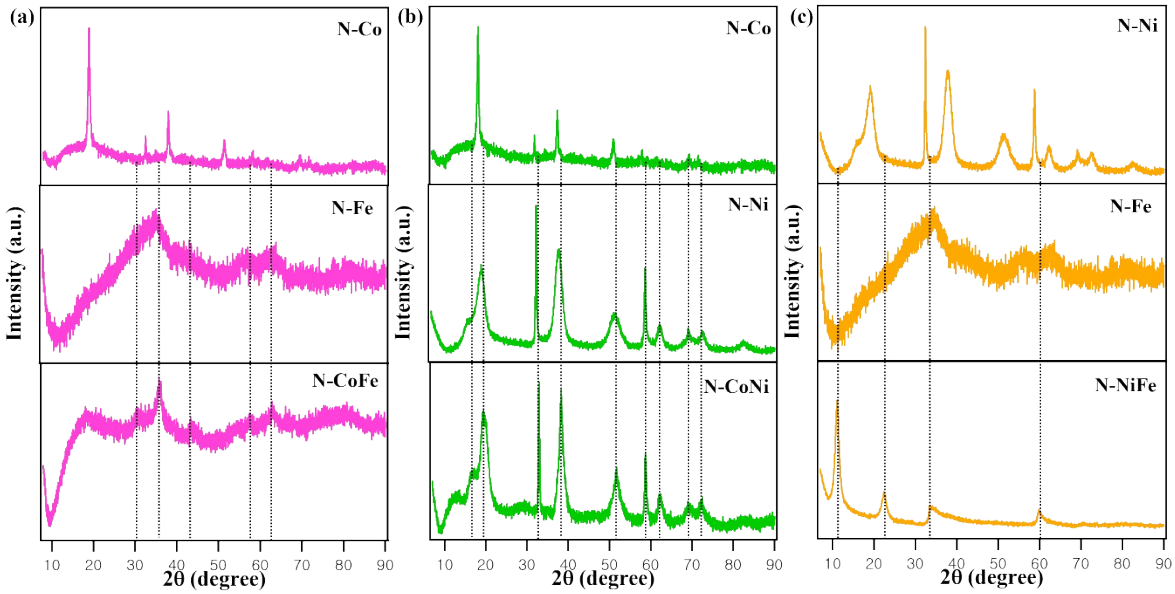

Figure S2. Comparison of XRD patterns; (a) N-Co, N-Fe, N-CoFe; (b) N-Co, N-Ni, N-CoNi; and (c) N-Ni, N-Fe, N-NiFe.

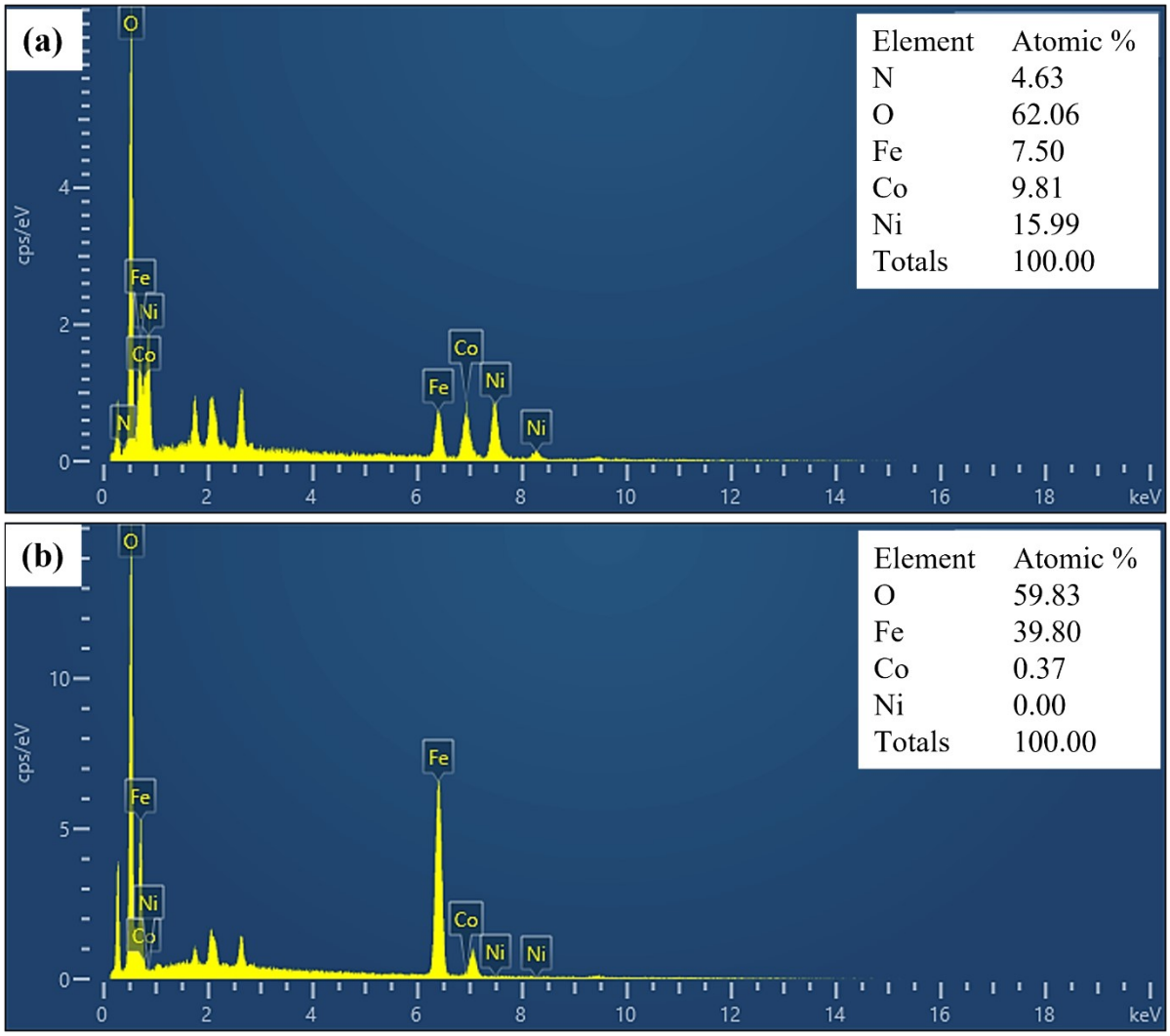

Figure S3. SEM-EDS analysis of (a) N-CoNiFe LDH and (b) CoNiFe.

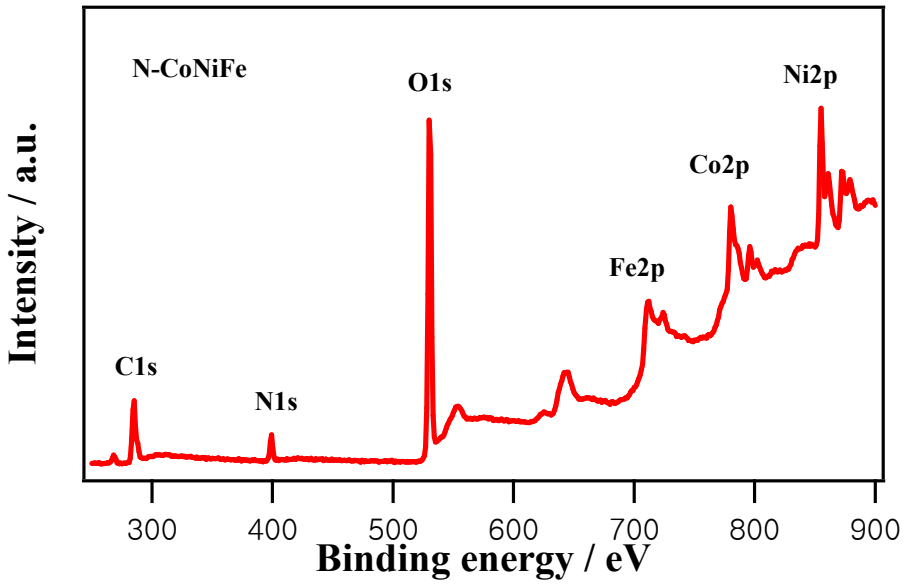

Figure S4. XPS survey scan of N-CoNiFe LDH catalyst.

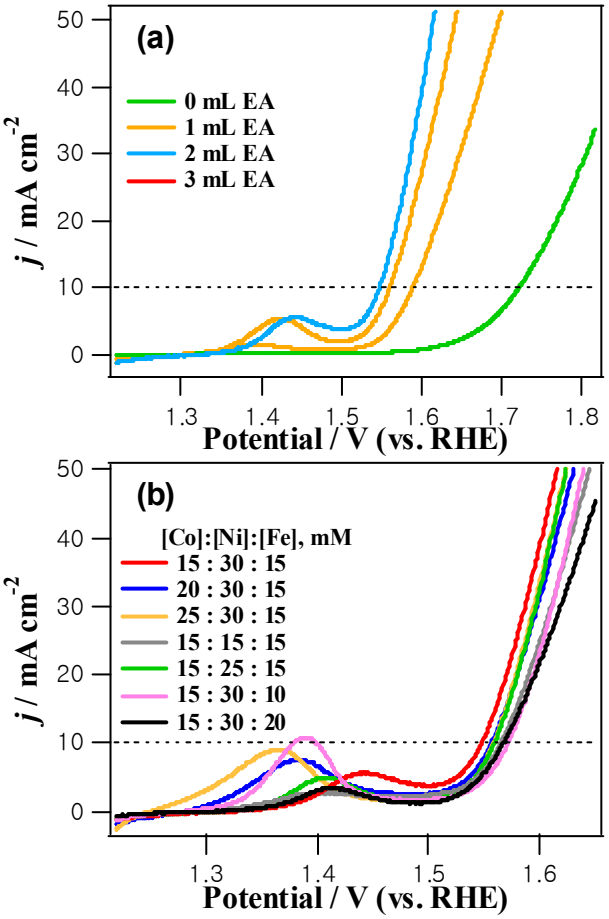

Figure S5. LSV curves in O_2-saturated 1.0 M KOH at a scan rate of 10 mV s^{-1} (rotational speed of 1600 rpm) of N-CoNiFe catalysts at various conditions: different (a) EA and (b) metal precursors (Co^{2+}, Ni^{2+}, and Fe^{3+}) concentrations.

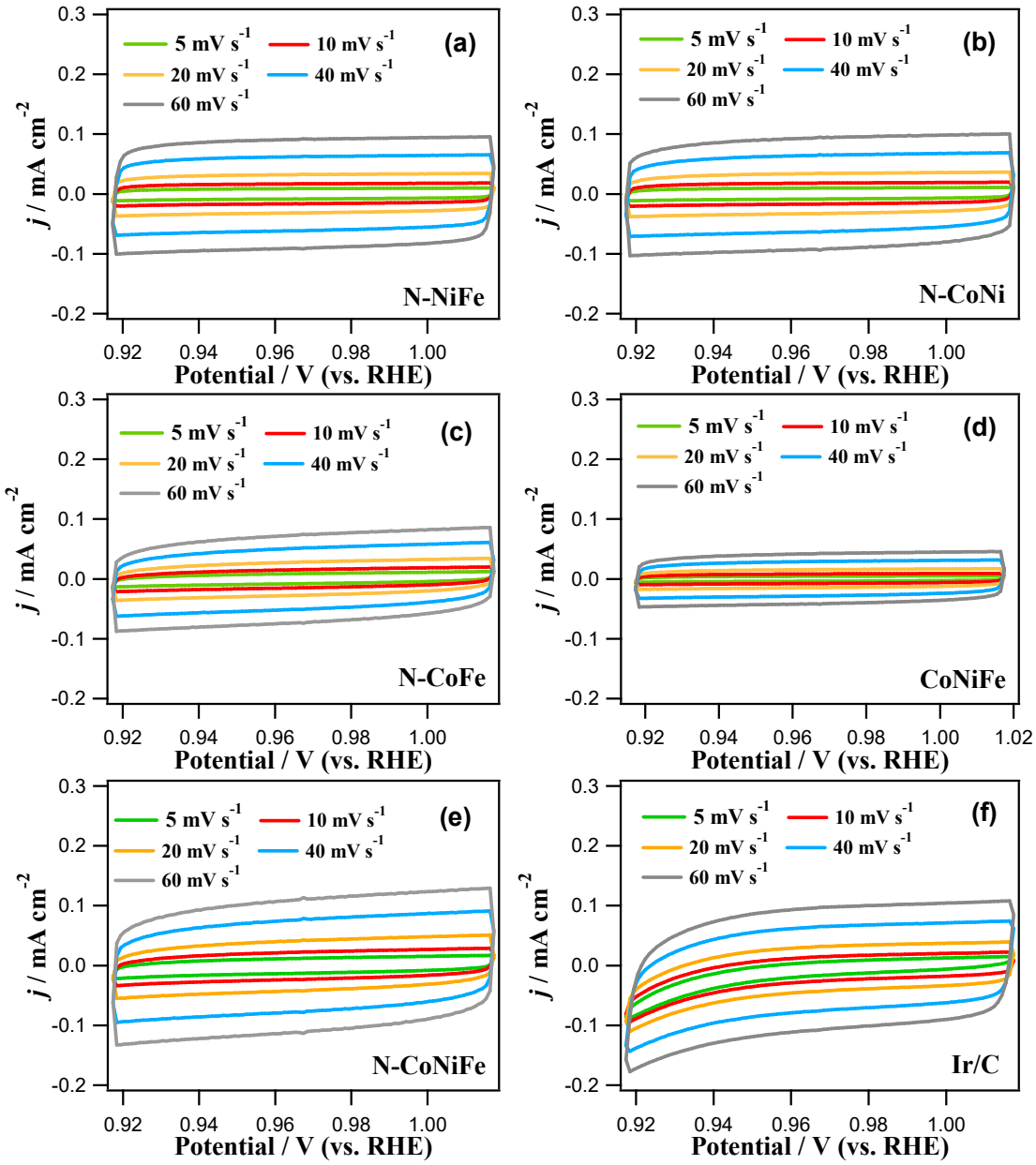

Figure S6. CV curves of (a) N-NiFe, (b) N-CoNi, (c) N-CoFe, (d) CoNiFe, (e) N-CoNiFe, and (f) Ir/C in 1.0 M KOH solution at different scan rates.

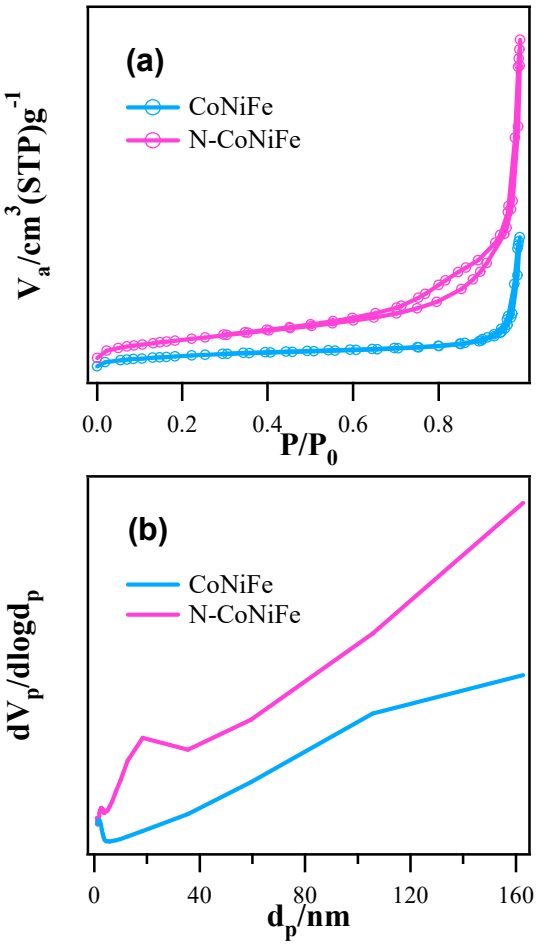

Figure S7. (a) BET surface areas and (b) pore-size distributions of an isothermal plot with N_2 adsorption/desorption.

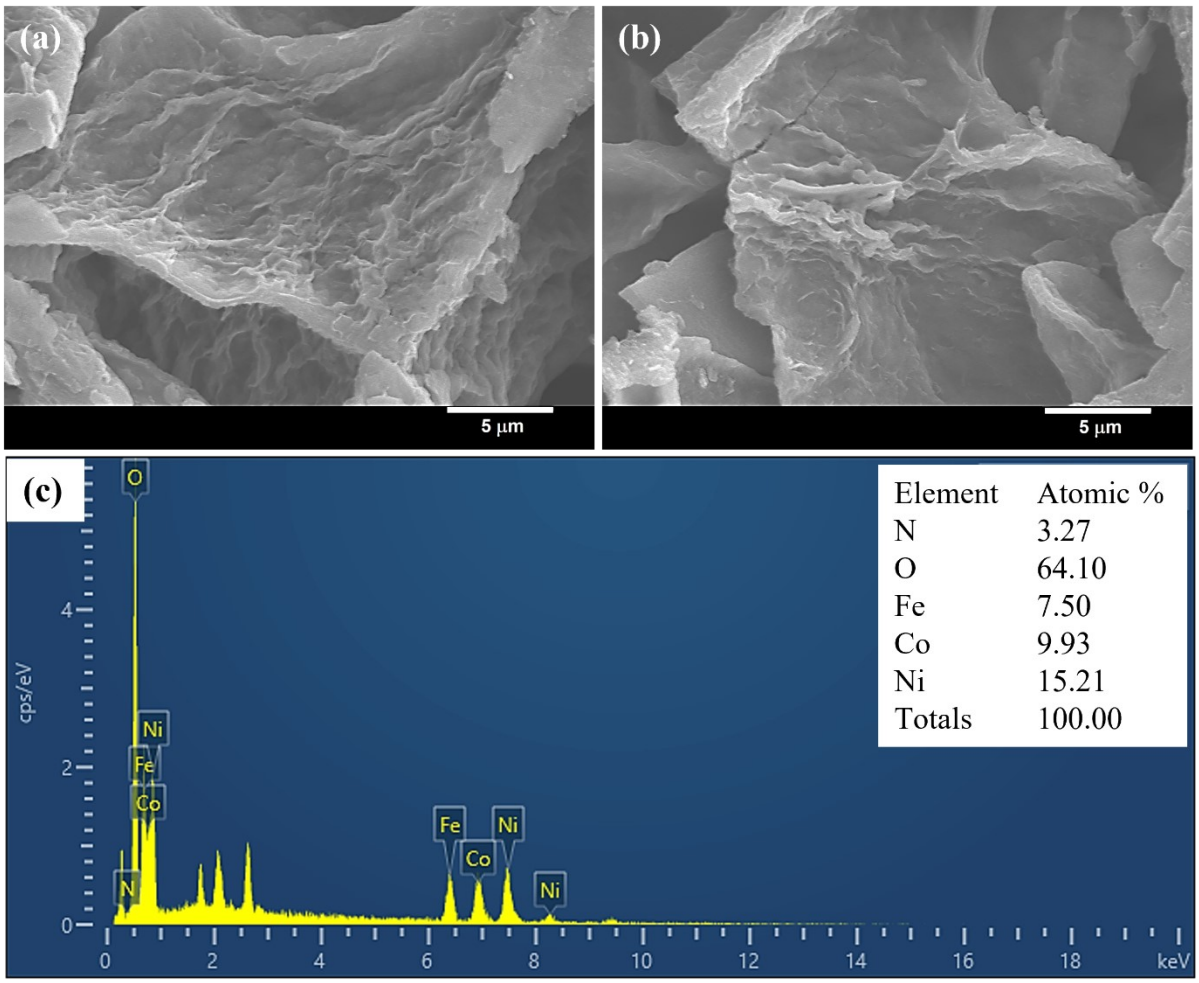

Figure S8. SEM images of N-CoNiFe LDH (a) before and (b) after stability test. (c) SEM-EDS analysis of N-CoNiFe LDH after stability test.

Table S1. Comparison of the OER catalytic performance for various CoNiFe-based catalysts in alkaline medium.

Electrode	Synthesis method	Overpotential @ 10 mA cm^{-2}	Tafel slope (mV dec^{-1})	Ref.
N-CoNiFe LDH/GC	reflux method	318 mV	72.2	This work
FeCoNi-S@ZIF/GC	hydrothermal synthesis of ZIF-67	420 mV	NR	*Mater. Today Energy*, 2020, **16**, 100405.
P-CoNiFe/GC	solvothermal process	279 mV	62.9	*Electrochim. Acta*, 2019, **318**, 883-891.
CoNiFe LDH/stainless steel	electrodeposition	196 mV	49	*J. Alloys Compd.*, 2021, **863**, 158081.
CoNiFe LDH/GC	dealloying process	240.4 mV	38.6	*ACS Sustainable Chem. Eng.*, 2018, **6**, 16096-16104.
CoNiFe LTHs/GC	MOF-mediated method	262 mV	88.1	*J. Colloid Interface Sci.*, 2021, **602**, 612-618.
CoNiFe-OH/nickel foam	electric-field assisted alkaline hydrolysis-oxidation strategy	207 mV	52.1	*Small*, 2022, **18**, 2104863.
$CoNiFeO_x$-NC/carbon paper	ion-exchange based strategy	265 mV (@ 50 mA cm^{-2})	64.1	*Appl. Catal. B-Environ.*, 2021, **287**, 119953.
CoNiFe-LDH/GC	chemical and structural transformations of a starting solid precursor α-$Co(OH)_2$	291	59	*ACS Appl. Energy Mater.*, 2018, **1**, 4998-5007.
2CoNiFe LDH/nickel foam	electrodeposition	224	41	*Energy Technol.*, 2021, **9**, 2100688.