

Solvent-induced crystal-facet effect of nickel-cobalt layered double hydroxide for highly efficient overall water splitting

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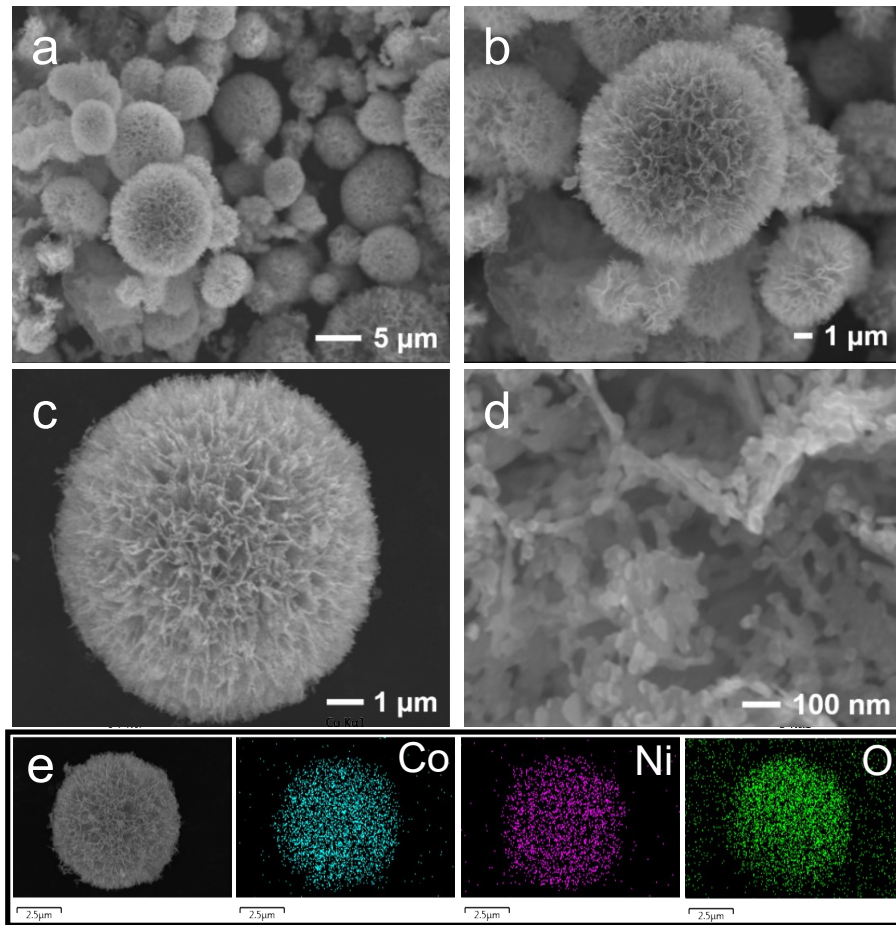


Fig. S1 Structural characterizations of $\text{Co}_{0.67}\text{Ni}_{0.33}(\text{OH})_2\text{-E}$. a-d, FESEM images. e, FESEM-EDS mapping images of Co, Ni and O elements.

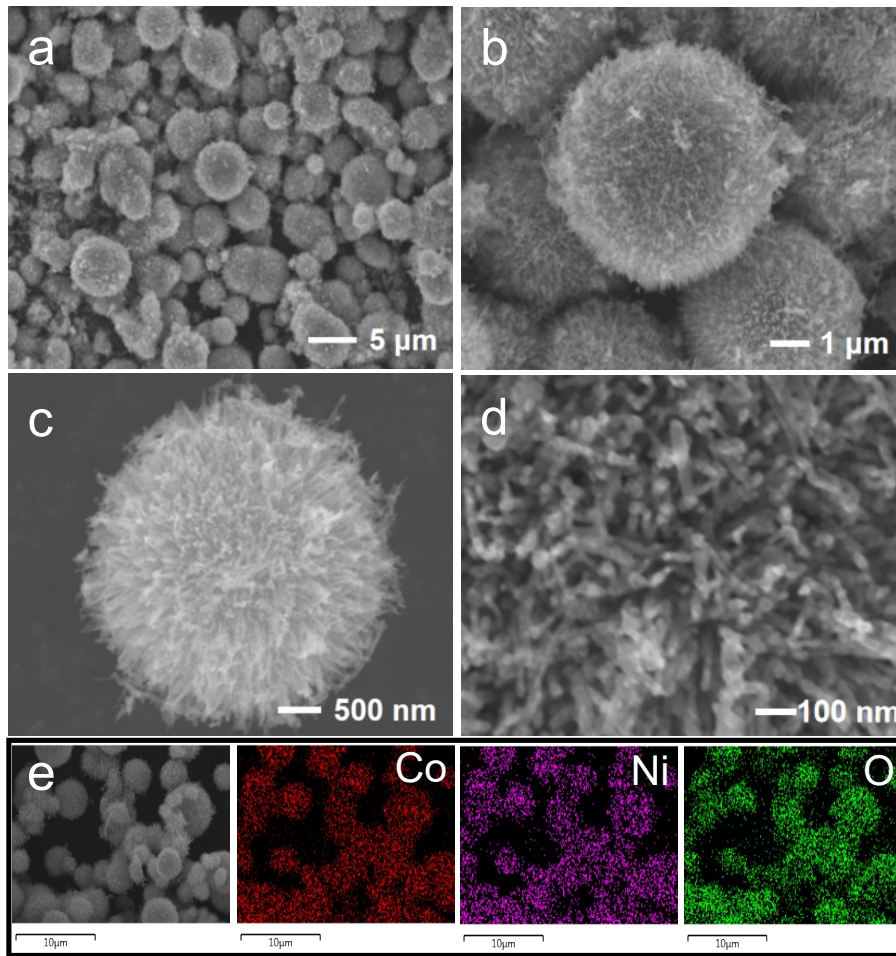


Fig. S2 Structural characterizations of $\text{Co}_{0.67}\text{Ni}_{0.33}(\text{OH})_2\text{-W}$. a-d, FESEM images. e, FESEM-EDS mapping images of Co, Ni and O elements.

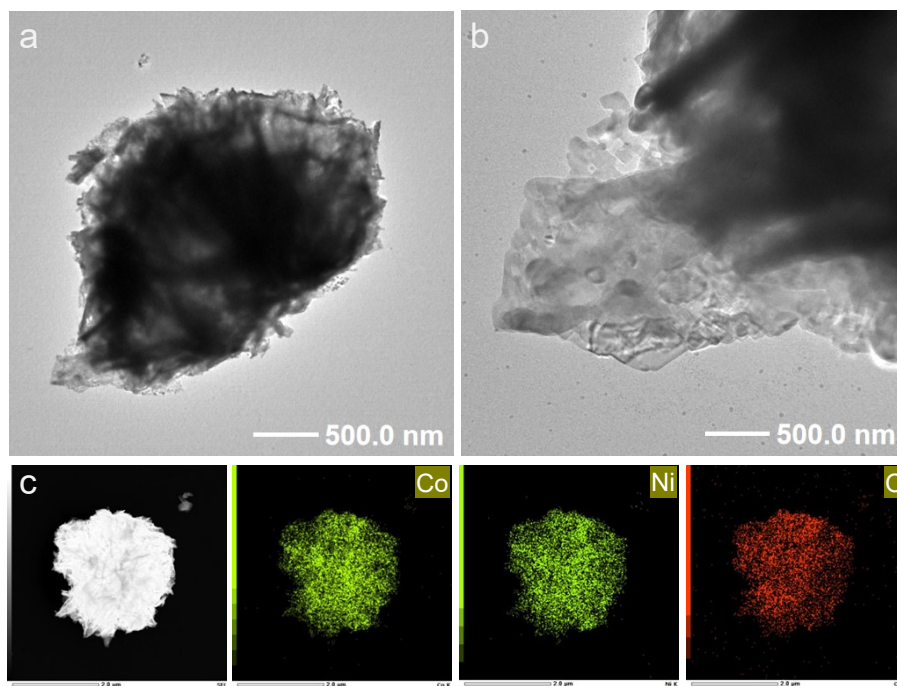


Fig. S3 Structural characterizations of $\text{Co}_{0.67}\text{Ni}_{0.33}(\text{OH})_2\text{-E}$. a-b, HRTEM images. c, HRTEM-EDX mapping images of Co, Ni and O elements.

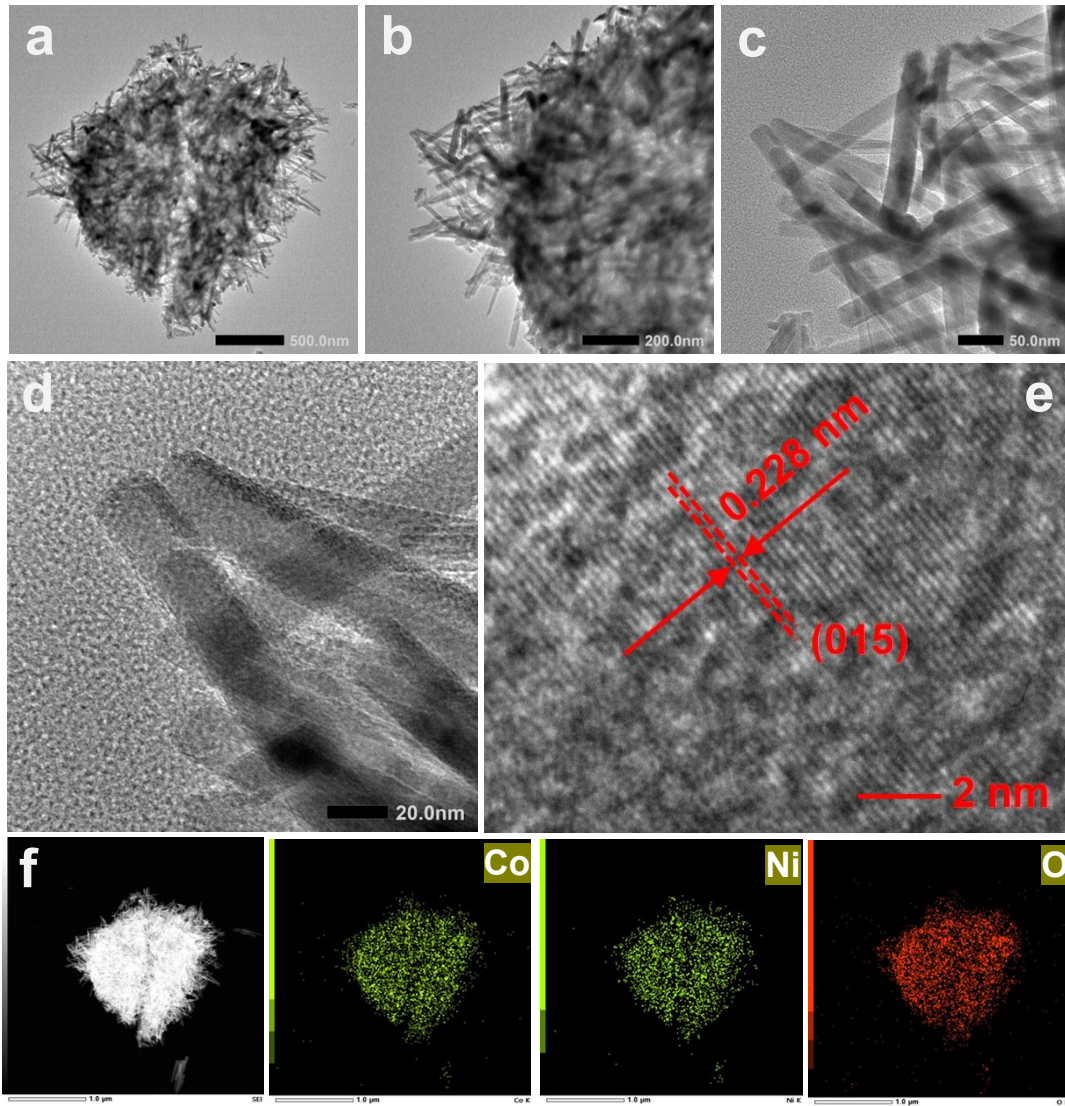


Fig. S4 Structural characterizations of $\text{Co}_{0.67}\text{Ni}_{0.33}(\text{OH})_2\text{-W}$. a-b, HRTEM images. c, HRTEM-EDX mapping images of Co, Ni and O elements.

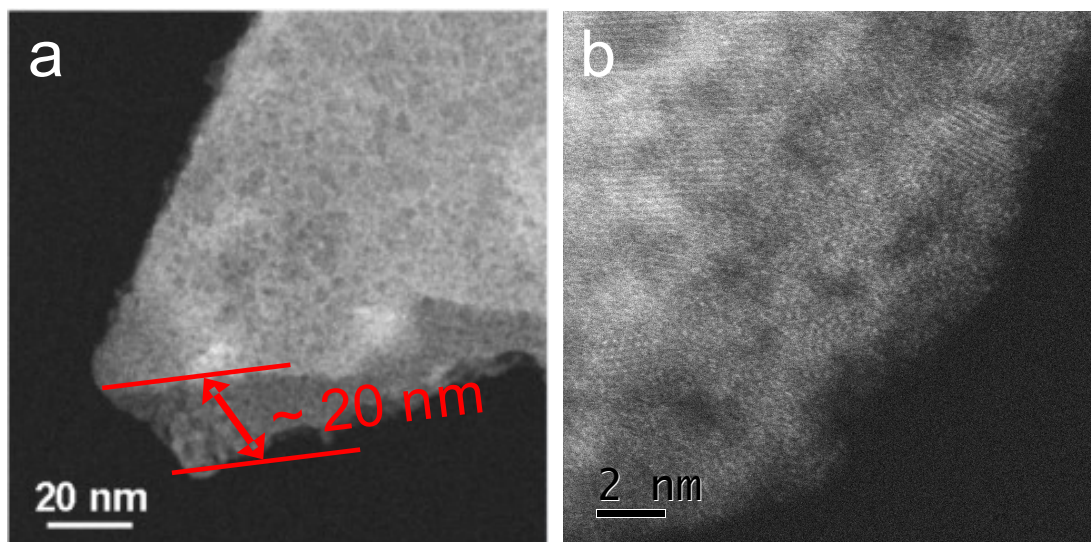


Fig. S5 Structural characterizations of $\text{Co}_{0.67}\text{Ni}_{0.33}(\text{OH})_2\text{-E}$.

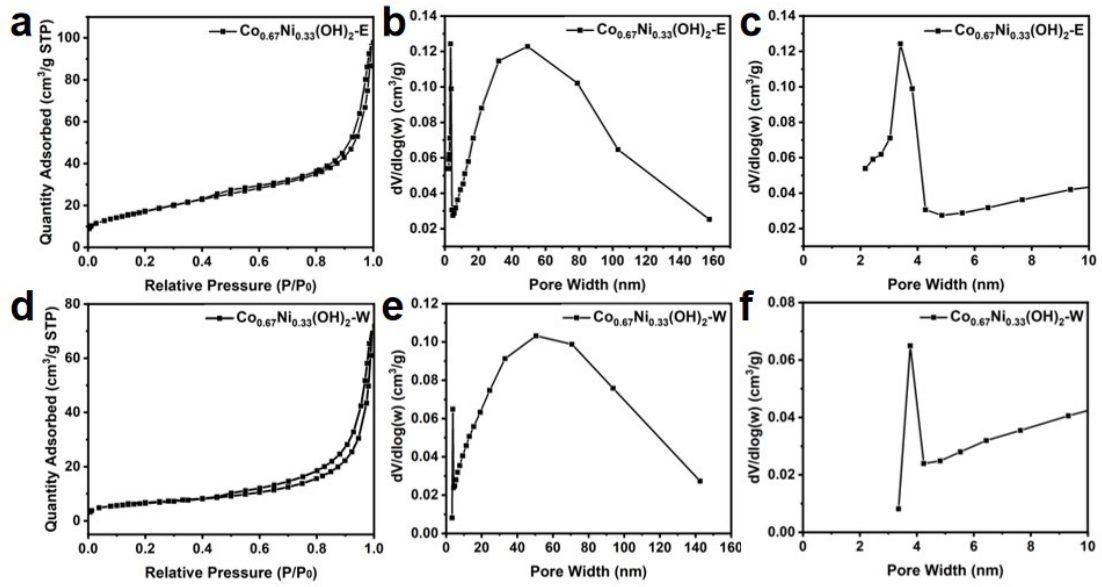


Fig. S6 Determination of the Brunauer-Emmett-Teller (BET) surface area. Nitrogen isothermal desorption curves for (a) $\text{Co}_{0.67}\text{Ni}_{0.33}(\text{OH})_2\text{-E}$ and (d) $\text{Co}_{0.67}\text{Ni}_{0.33}(\text{OH})_2\text{-W}$. Pore size distribution based on the BJH model for (b-c) $\text{Co}_{0.67}\text{Ni}_{0.33}(\text{OH})_2\text{-E}$ and (e-f) $\text{Co}_{0.67}\text{Ni}_{0.33}(\text{OH})_2\text{-W}$.

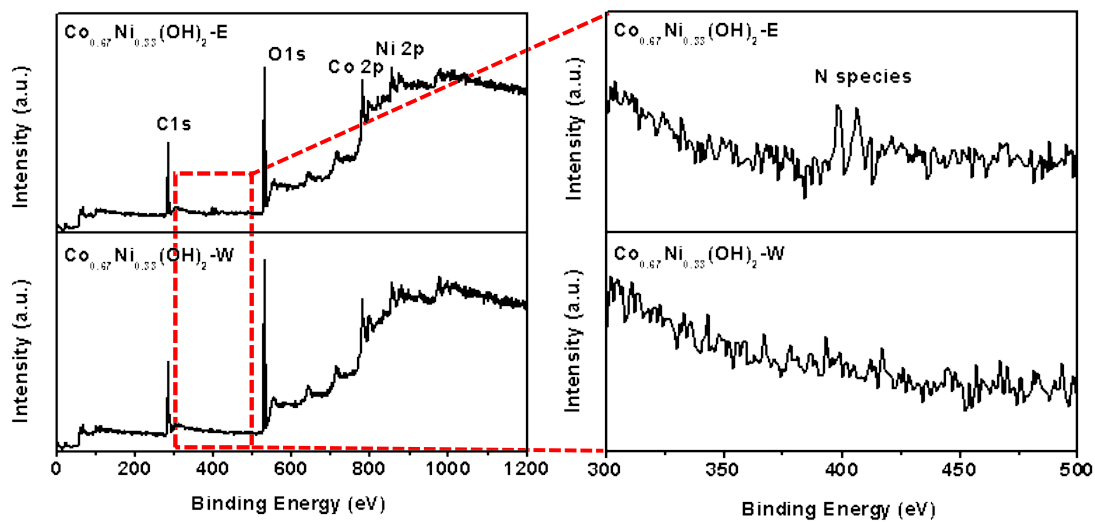


Fig. S7 High resolution XPS spectra. The survey spectra of Co_{0.67}Ni_{0.33}(OH)₂-E (up) and Co_{0.67}Ni_{0.33}(OH)₂-W (down).

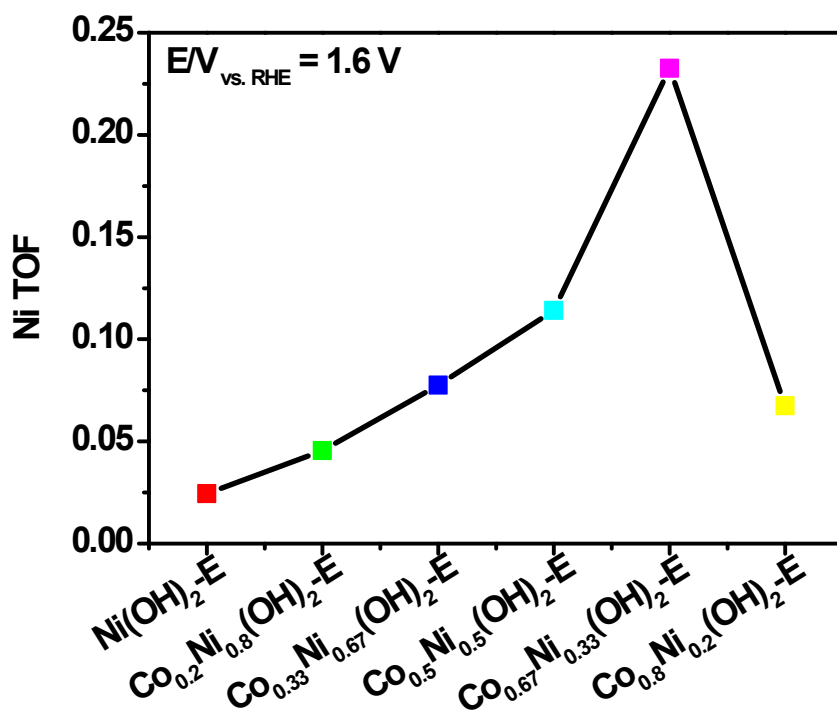


Fig. S8 Ni-TOF values of $\text{Co}_x\text{Ni}_{1-x}(\text{OH})_2\text{-E}$ at 1.6 V.

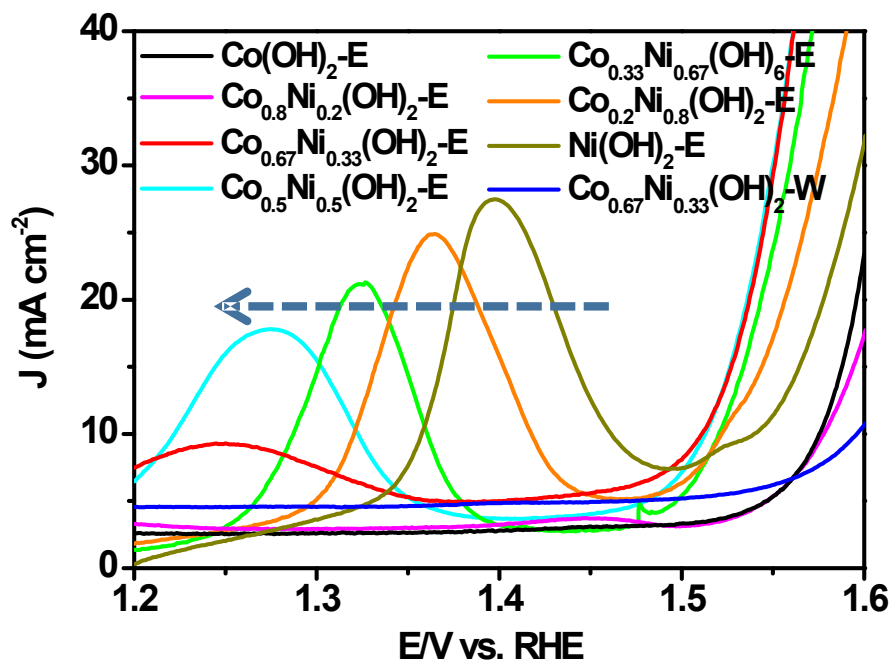


Fig. S9 Cyclic voltammograms of $\text{Co}_x\text{Ni}_{1-x}(\text{OH})_2$ surface in Ar-saturated 1 M KOH solution at a scan rate of 5 mV s^{-1} .

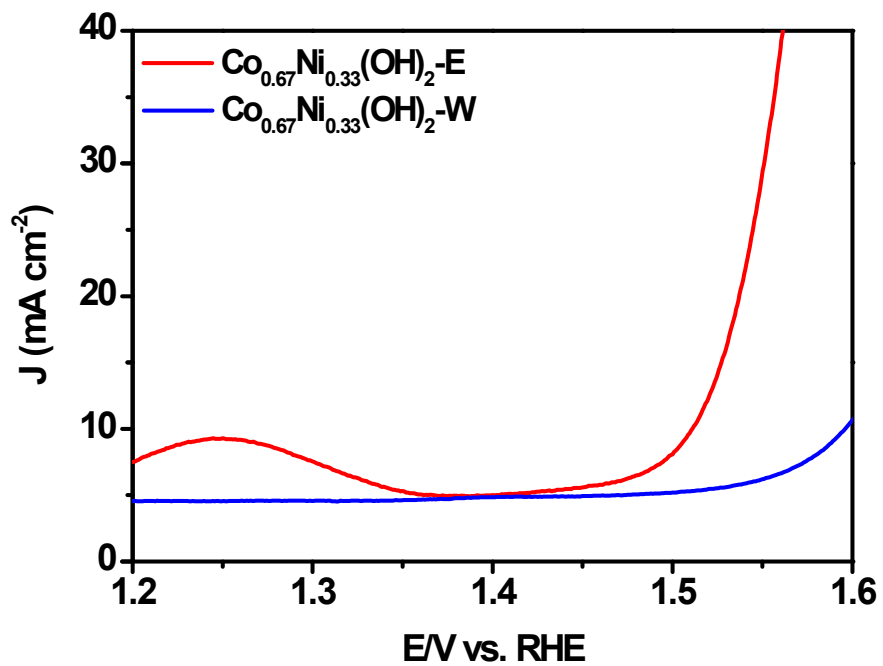


Fig. S10 Cyclic voltammograms of OER at $\text{Co}_x\text{Ni}_{1-x}(\text{OH})_2\text{-E}$ and $\text{Co}_x\text{Ni}_{1-x}(\text{OH})_2\text{-W}$ surface in Ar-saturated 1 M KOH solution at a scan rate of 5 mV s^{-1} .

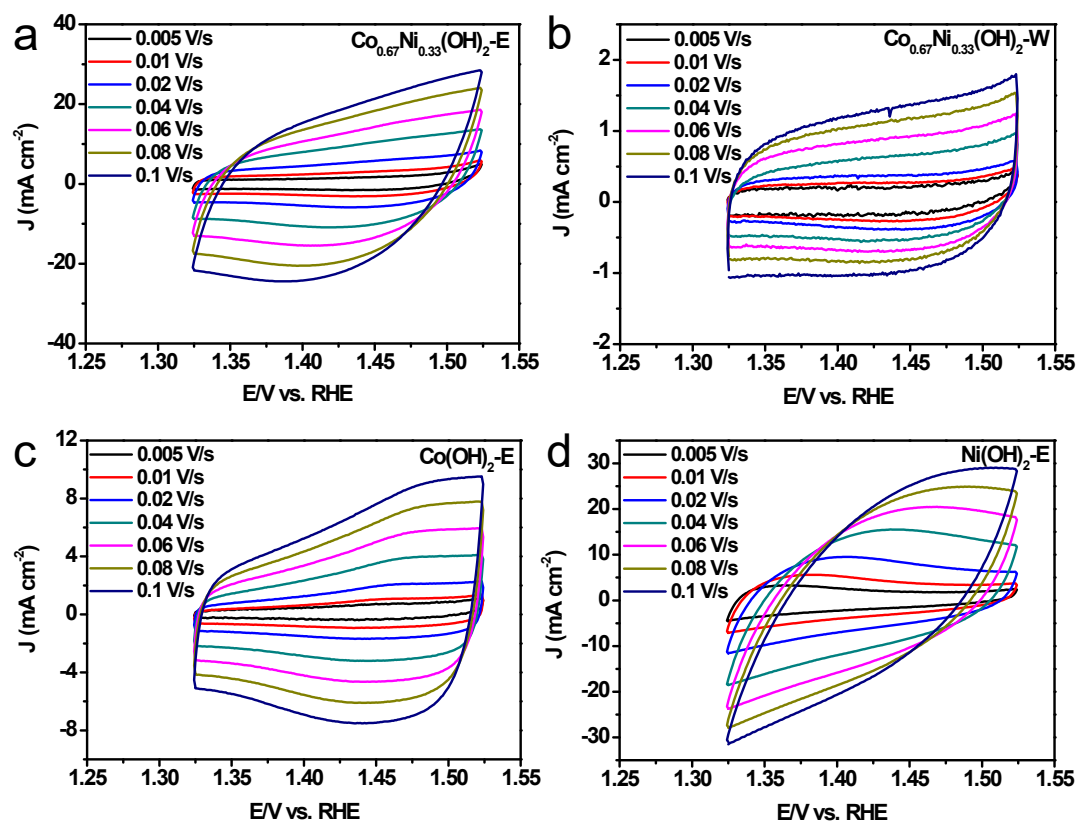


Fig. S11 Cyclic voltammograms of $\text{Co}_x\text{Ni}_{1-x}(\text{OH})_2$ surface in Ar-saturated 1 M KOH solution at a scan rate of 5 mV s^{-1} in the potential range of 1.325-1.525 V (vs. RHE). a, $\text{Co}_{0.67}\text{Ni}_{0.33}(\text{OH})_2\text{-E}$. b, $\text{Co}_{0.67}\text{Ni}_{0.33}(\text{OH})_2\text{-W}$. c, $\text{Co}(\text{OH})_2\text{-E}$. d, $\text{Ni}(\text{OH})_2\text{-E}$.

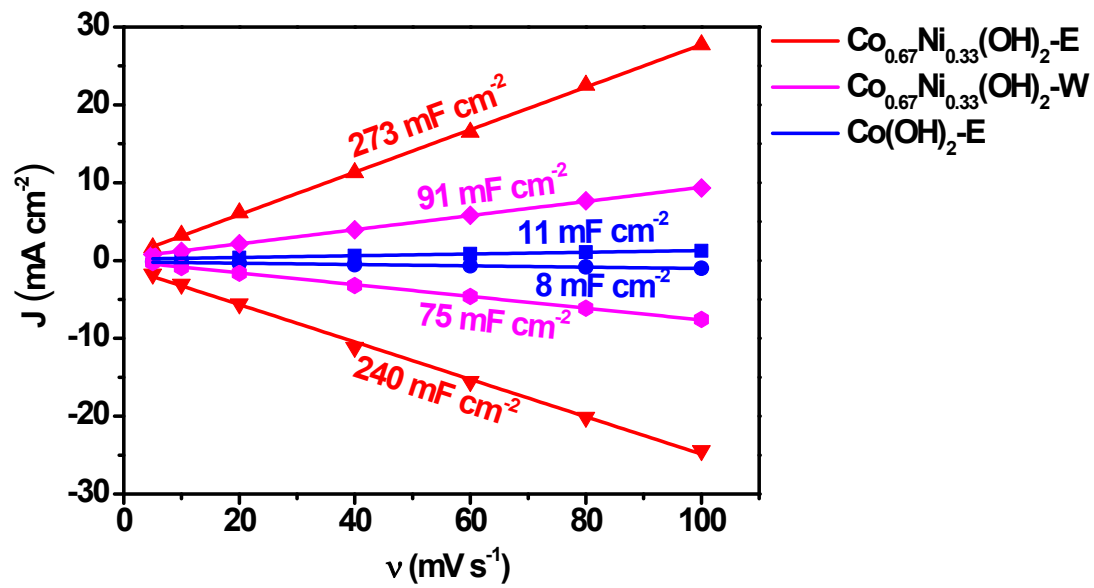


Fig. S12 The plots of scan rates vs. current densities corresponding to the cyclic voltammograms as shown in Fig. S11.

Table S1. Comparison of the OER performances of various (Ni or Co)-based LDH catalysts and noble metal catalysts.

Catalysts	Electrolyte	Substrate	Overpotential [mV] at specific current density	Tafel slope [mV dec ⁻¹]	Ref.
Exfoliated NiFe LDH	1 M KOH	GC	302@10 mA cm ⁻²	40	1
NiO/NiCo ₂ O ₄	1 M KOH	GC	357@10 mA cm ⁻²	130	2
NiCo ₂ P _x /CNTs	1 M KOH	GC	284@10 mA cm ⁻²	50.3	3
NiFe LDH/NiFe phosphate	1 M KOH	Carbon fiber paper	290@10 mA cm ⁻²	38	4
FeNi LDH/Ti ₃ C ₂ -MXene	1 M KOH	GC	298@10 mA cm ⁻²	43	5
CoNi LDH/CoO	1 M KOH	GC	300@10 mA cm ⁻²	123	6
NiCo ₂ O ₄ /NiCoFe LDH	1 M KOH	Carbon cloth	302@50 mA cm ⁻²	71.5	7
Ni _{0.6} Co _{1.4} P nanocages	1 M KOH	GC	300@10 mA cm ⁻²	80	8
CoNi/NC-YS	1 M KOH	Carbon fiber paper	292@10 mA cm ⁻²	53.8	9
CoNi-Fe ₃ N	1 M KOH	Iron foil	285@10 mA cm ⁻²	34	10
Ni _{0.75} Fe _{0.25} -LDH	1 M KOH	GC	~300@10 mA cm ⁻²	~50	11
NiCo-LDH nanosheets	1 M KOH	GC	~350@10 mA cm ⁻²	41	1
NiCo LDH nanoplates	1 M KOH	Carbon paper	367@10 mA cm ⁻²	40	12
Co _{1.8} Ni(OH) _{5.6} @Co _{1.8} NiS _{0.4} (OH) _{4.8}	0.1 M KOH	GC	274@10 mA cm ⁻²	45	13
IrO ₂ @SL-NiFe LDHs	1 M KOH	GC	270@10 mA cm ⁻²	59	14
SL-NiFe LDHs	1 M KOH	GC	343@10 mA cm ⁻²	139	14
IrO ₂	1 M KOH	GC	325@10 mA cm ⁻²	45	1
RuO ₂	1 M KOH	GC	291@10 mA cm ⁻²	81	15
Co _{0.67} Ni _{0.33} (OH) ₂ -E	1 M KOH	GC	280@10 mA cm ⁻²	81	This work

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