Supporting Information

Special $NaBH_4$ hydrolysis achieving multiple-surface-modifications promotes high-throughput water oxidation of CoN nanowire arrays

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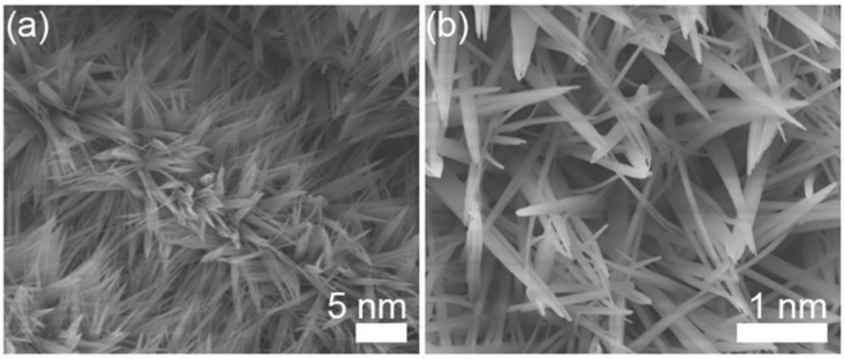

Fig. S1 SEM of Co(OH)F $_{NWAs}$/CC.

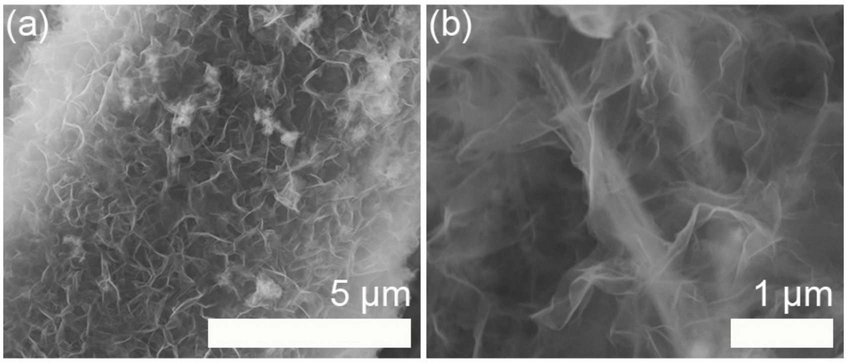

Fig. S2 SEM of B_1-CoN $_{NWAs}$/CC.

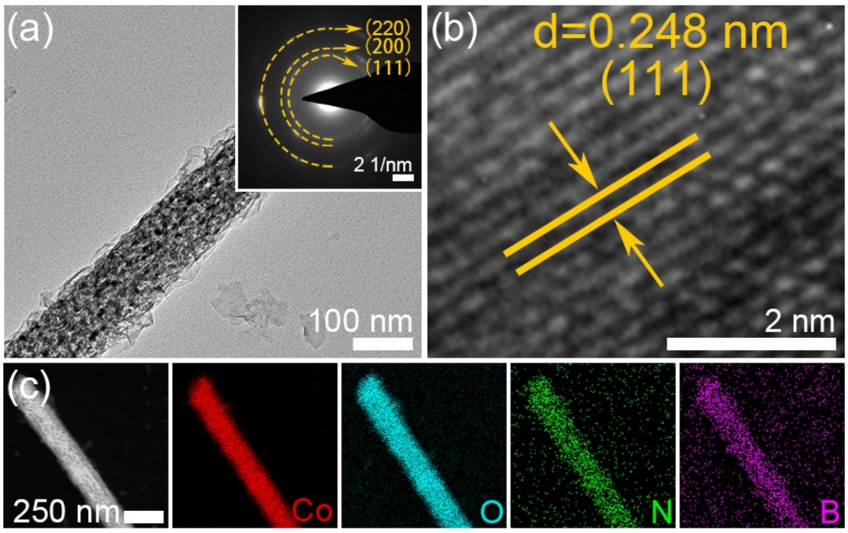

Fig. S3 TEM, SAED, HRTEM, HAADF-STEM and mapping of B_1-CoN $_{NWAs}$/CC.

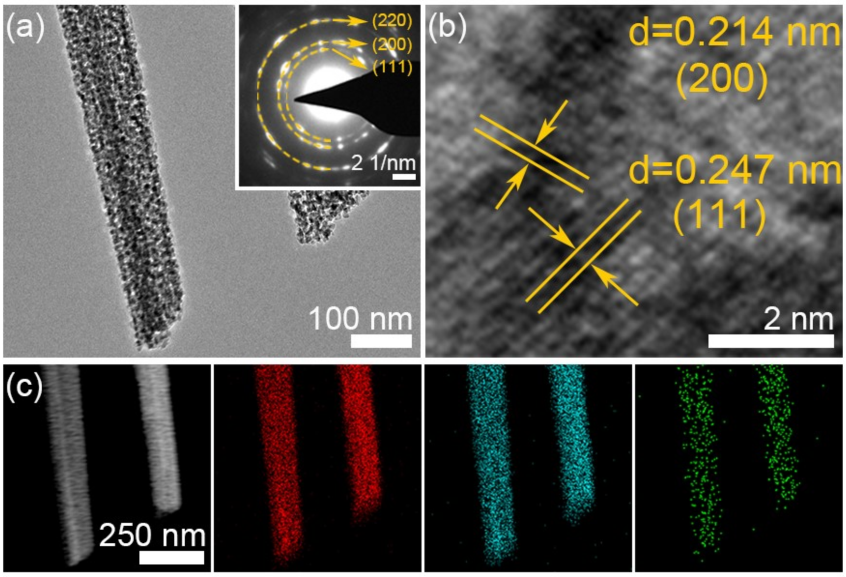

Fig. S4 TEM, SAED, HRTEM, HAADF-STEM and mapping of CoN $_{NWAs}$/CC.

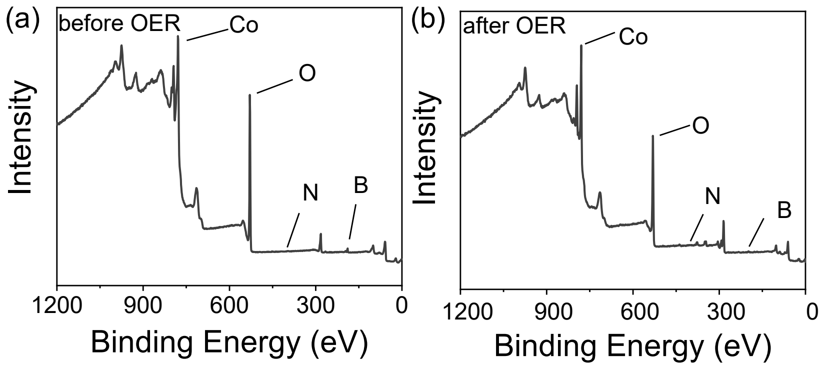

Fig. S5 Survey XPS spectrums of $B_{0.1}$-CoN $_{NWAs}$/CC about before OER (a) and after OER (b).

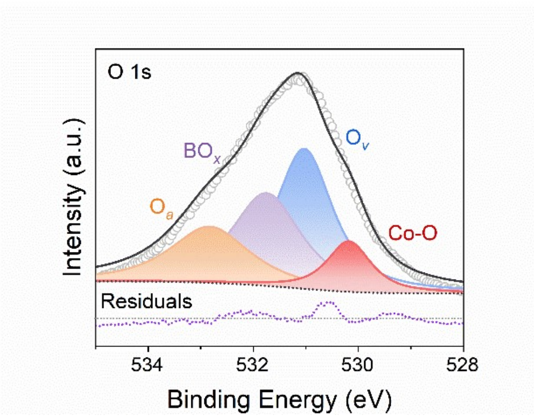

Fig. S6 High-resolution O 1s spectra of B_1-CoN $_{NWAs}$/CC.

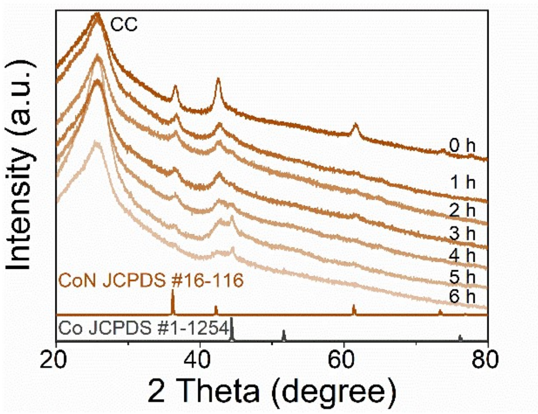

Fig. S7 XRD spectra of CoN $_{NWAs}$/CC soaked in 0.1 M $NaBH_4$ solution for one to six hours.

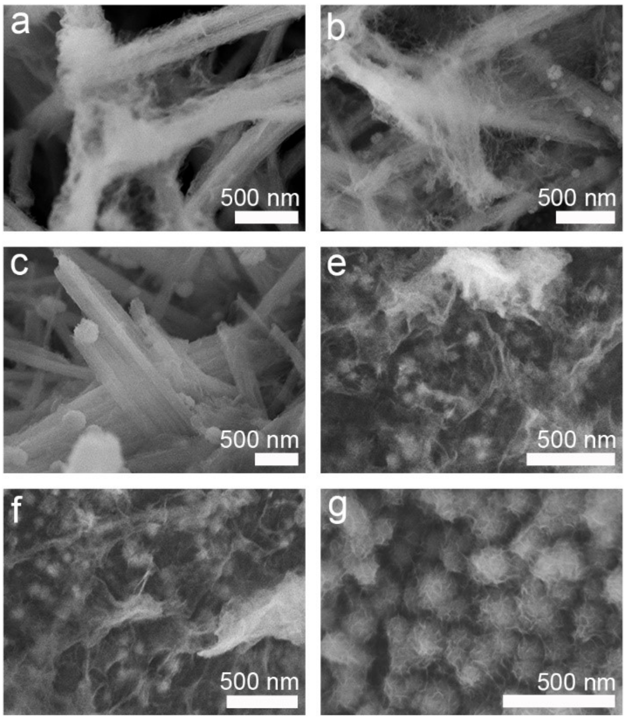

Fig. S8 SEM images of CoN $_{NWAs}$/CC soaked in 0.1 M $NaBH_4$ solution for (a-g) one to six hours.

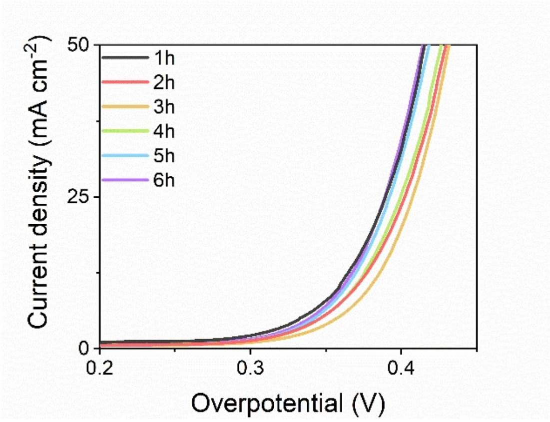

Fig. S9 LSV curves of CoN $_{NWAs}$/CC soaked in 0.1 M $NaBH_4$ solution for one to six hours.

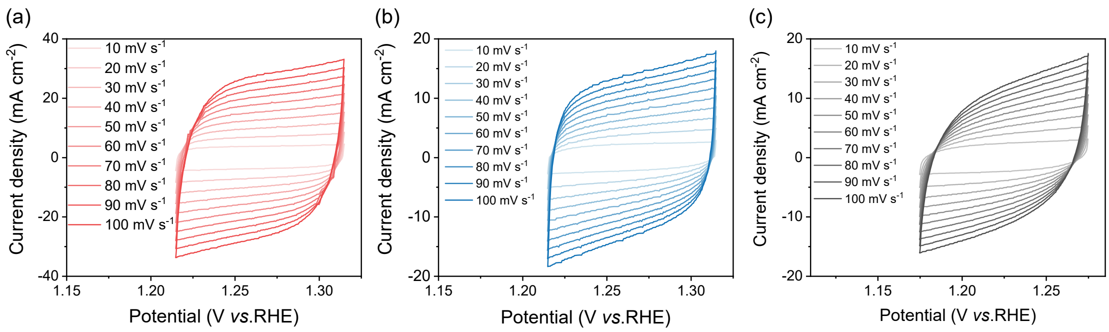

Fig. S10 C_{dl} of (a) $B_{0.1}$-CoN $_{NWAs}$/CC, (b) B_1-CoN $_{NWAs}$/CC and (c) CoN $_{NWAs}$/CC.

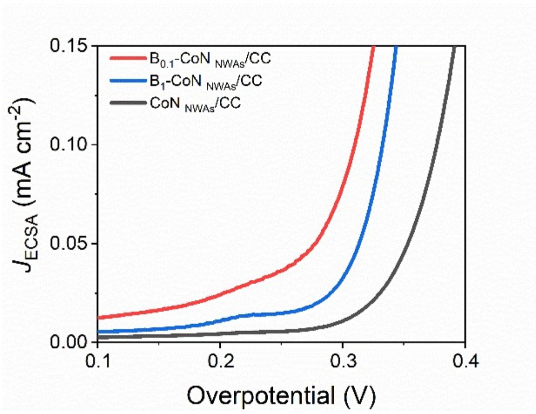

Fig. S11 ECSA normalized LSV curves of these catalysts.

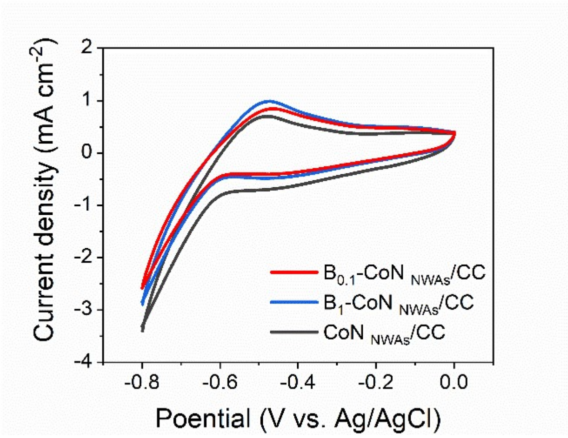

Fig. S12 Cyclic voltammetry cycling in pH = 7 phosphate buffer with a scan rate of 50 mV s^{-1} range from -0.8 to 0 V *vs.* Ag/AgCl of $B_{0.1}$-CoN $_{NWAs}$/CC, B_1-CoN $_{NWAs}$/CC and CoN $_{NWAs}$/CC.

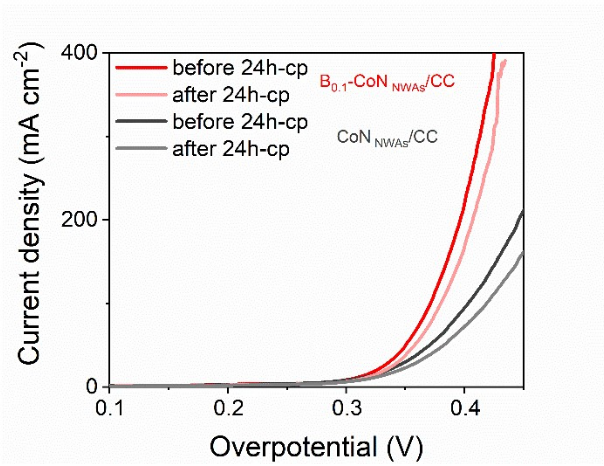

Fig. S13 LSV curves of $B_{0.1}$-CoN $_{NWAs}$/CC and CoN $_{NWAs}$/CC before and after 24 h Chronopotentiometry measurements.

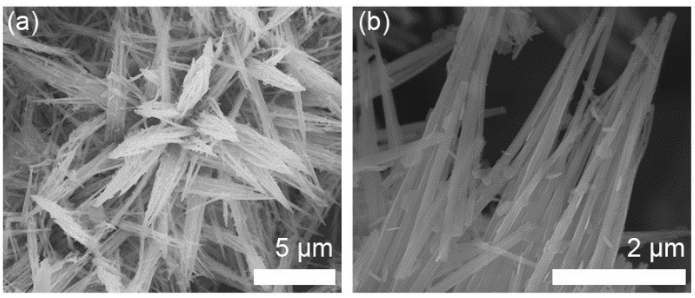

Fig. S14 SEM image of CoN $_{NWAs}$/CC after OER.

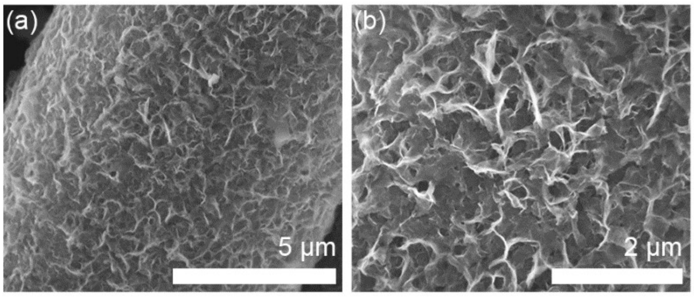

Fig. S15 SEM image of B_1-CoN $_{NWAs}$/CC after OER.

Table S1. XPS results of $B_{0.1}$-CoN $_{NWAs}$/CC before OER.

		BE (eV)	FWHM (eV)	% area
Co 2p 3/2	Co-N	779.80	1.1	5.2
	Co^{3+}	780.92	1.7	17.3
	Co^{2+}	782.20	3.3	27.8
	Sat.	786.40	5.0	17.8
Co 2p 1/2	Co^{3+}	796.28	1.9	0.1
	Co^{2+}	797.44	2.4	11.5
	Sat.	802.82	5.0	12.6
N 1s	B-N	397.45	1.9	17.3
	Pyridinic-N	398.45	1.2	10.9
	Co-N-B	399.45	1.2	17.3
	Pyrrolic-N	400.30	1.0	4.5
	N-O	403.16	3.0	50.0
B 1s	Co-N-B	189.50	1.2	12.0
	B-N	190.84	1.7	40.0
	B-O	191.52	1.3	48.0
O 1s	Co-O	530.62	1.0	19.3
	O_v	531.28	1.3	40.1
	BO_x	532.13	1.3	26.4
	O_a	533.12	2.0	14.2

Table S2. XPS results for the O 1s of B_1-CoN $_{NWAs}$/CC before OER.

		BE (eV)	FWHM (eV)	% area
O 1s	Co-O	530.18	1.0	10.8
	O_v	531.03	1.3	44.9
	BO_x	531.75	1.6	29.0
	O_a	532.83	1.8	15.3

Table S3. Comparison of OER properties of other cobalt-based catalysts.

Catalysts	η10	Electrolyte	Rerences
NiO/CoN PINWs	300	0.1M KOH	S1
Co@CNT/MSC	396	0.1M KOH	S2
$NiCo_2O_4/CoN_x$-NMC	370	0.1M KOH	S3
CoNS/C	345	0.1M KOH	S4
$Co_{5.47}N/Co_3Fe_7$/NC	379	1M KOH	S5
g $CoN_x/NiFeO_x$/N-RGO	372	1M KOH	S6
ZnCoHCF-3	350	1M KOH	S7
Co-LDHs-4	241	1M KOH	S8
CoN-Gr-2	280	1M KOH	S9
(N, S)-RGO@CoN	220	1M Na_2SO_4	S10
Cu_6Co_7/CC	500	0.2 M PBS	S11
CoN/Co_4N	398	1 M PBS	S12
Co_4N-CeO_2/GP	239	1M KOH	S13
Co_4N@CNNT	285	1M KOH	S14
CoN@Ni foam	290	1M KOH	S15
$Co_{5.47}N$@N-rGO	350	1M KOH	S16
Co_3N@AN-C	280	1M KOH	S17
Ni-Co_4N	233	1M KOH	S18
$CoO/CoSe_2$	396	0.5 M PBS	S19

Table S4. XPS results for the Co 2p, N 1s, B 1s and O 1s of $B_{0.1}$-CoN $_{NWAs}$/CC after OER.

		BE (eV)	FWHM (eV)	% area
Co 2p $_{3/2}$	Co^{3+}	779.90	1.9	44.8
	Co^{2+}	781.30	1.8	13.8
	Sat.	789.50	6.0	6.9
Co 2p $_{1/2}$	Co^{3+}	794.72	1.2	8.6
	Co^{2+}	795.90	3.1	19.0
	Sat.	805.42	5.0	6.9
N 1s	N-B	397.45	1.2	0.1
	Pyridinic-N	398.90	0.9	11.3
	N-Co	399.63	1.3	31.0
	Pyrrolic-N	400.66	1.5	8.5
	N-O	403.60	2.8	35.2
B 1s	B-N	191.10	0.5	21.7
	B-O	191.58	0.9	78.3
O 1s	Co-O	529.52	1.5	35. 4
	O_v	530.85	1.4	38.3
	BO_x	531.75	1.5	20.7
	O_a	533.00	2.0	5.6

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