Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

Supporting Information for

Hierarchically Structured CoN/Cu_3N Nanotube Array Supported on Copper Foam as Efficient Bifunctional Electrocatalyst for Overall Water Splitting

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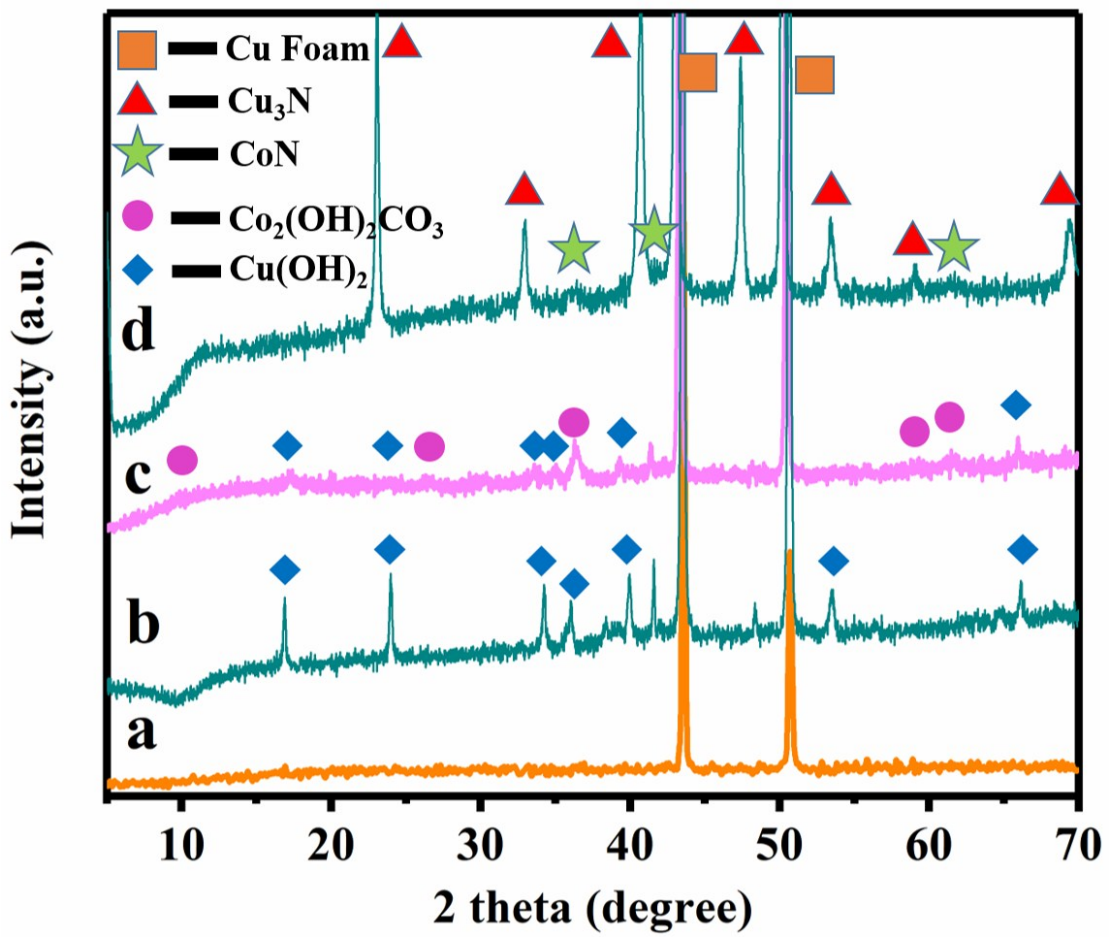

Fig. S1. XRD pattern of bare CF (curve a), $Cu(OH)_2$/CF (curve b), $Co_2(OH)_2CO_3$/$Cu(OH)_2$/CF (curve c) and NC@CoN/Cu_3N/CF (curve d).

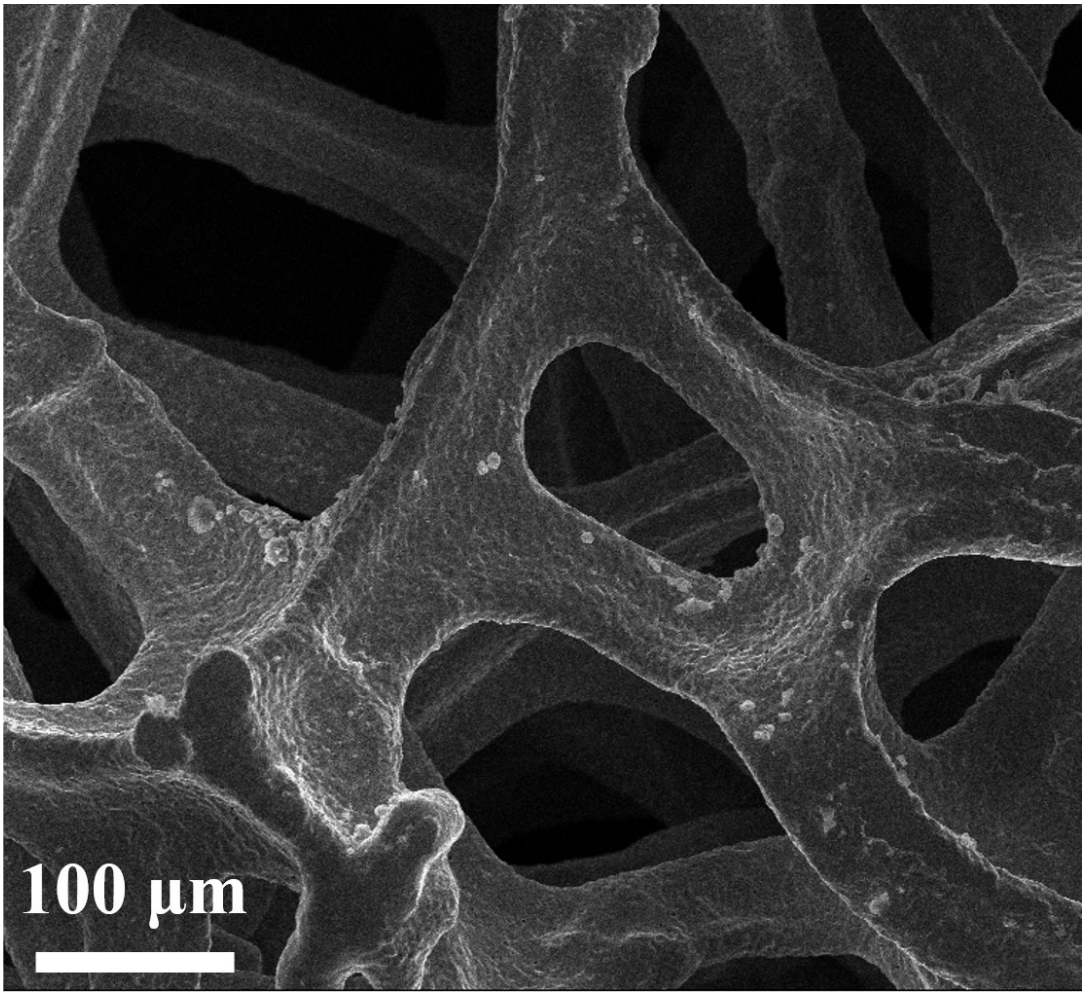

Fig. S2. SEM image of bare CF.

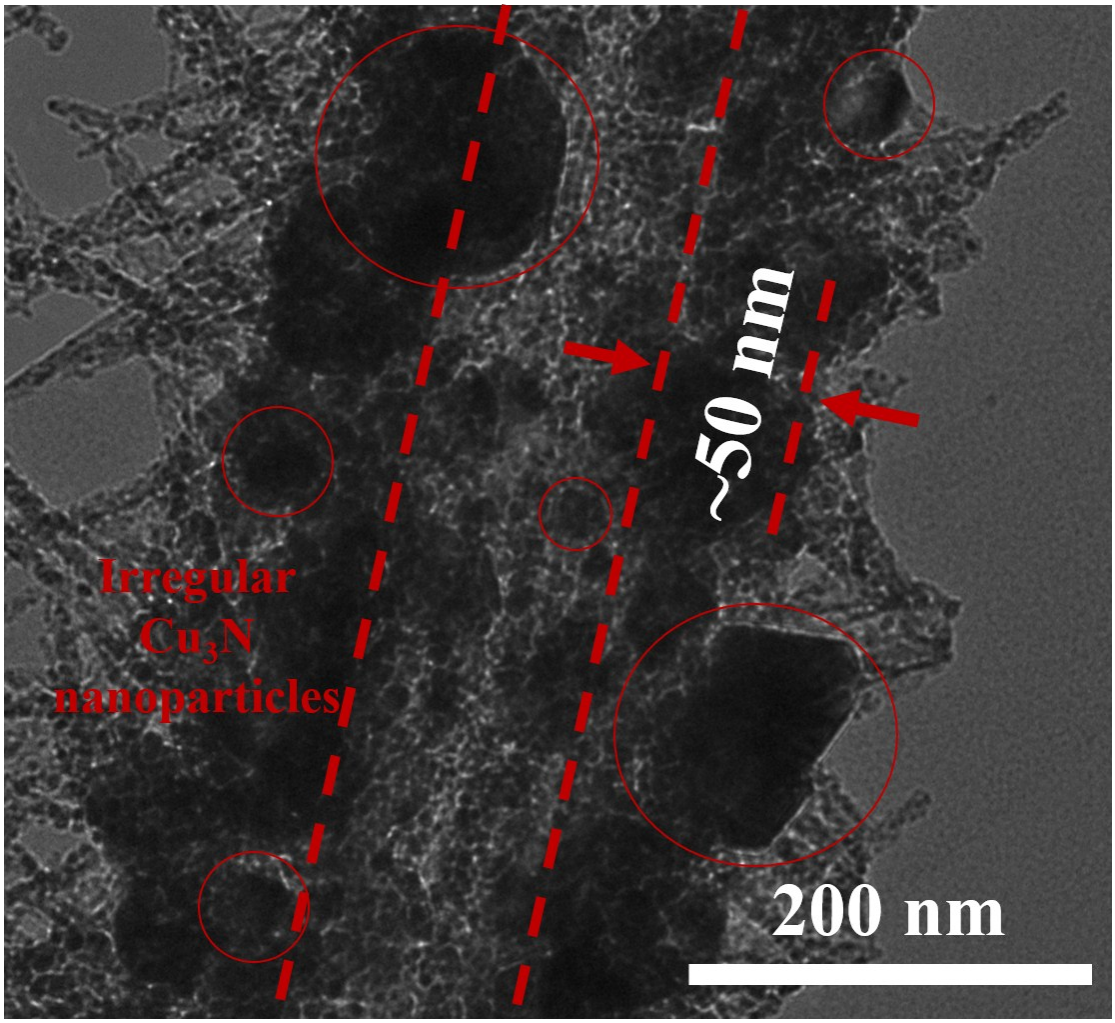

Fig. S3. TEM images of NC@CoN/Cu_3N/CF (with the irregular Cu_3N nanoparticles).

Table S1. Comparison of the HER activity of NC@CoN/Cu_3N/CF with that of some recently reported bifunctional non-precious based electrocatalysts.

Electrocatalyst	HER η_{10mA/cm^2} (mV vs. RHE)	Tafel slope (mV/Dec)	Ref.
NC@CoN/Cu_3N/CF	134	99.2	This work
Cu@CoS_x/CF	134	61	28
NiN_x nanotube arrays	~110	127	30
TiO_2@Co_9S_8	139	65	31
NC@$CuCoN_x$/CF	105	76	38
$Co_5Mo_{1.0}P$ NSs@NF	173	190	45
NESSP	230	36	46
Co-P film/CF	94	42	47
$CuCo_2O_4$/NF	140	108	48

Table S2. Comparison of the OER activity of NC@CoN/Cu_3N/CF with that of some recently reported bifunctional non-precious based electrocatalysts.

Electrocatalyst	OER η_{10mA/cm^2} (mV vs. RHE)	OER η_{50mA/cm^2} (mV vs. RHE)	Tafel slope (mV/Dec)	Ref.
NC@CoN/Cu_3N/CF	257	303	75.7	This work
Cu@CoS_x/CF	160	~280	--	28
$CoNi(OH)_x$ nanotube arrays	280	320	77	30
TiO_2@Co_9S_8	139	~283	55	31
NC@$CuCoN_x$/CF	230	~305	84	38
$Co_5Mo_{1.0}O$ NSs@NF	270	~310	54.4	45
NESS	278	~350	83	46
Co-P film/CF	345	~390	47	47
$CuCo_2O_4$/NF	--	~310	68	48

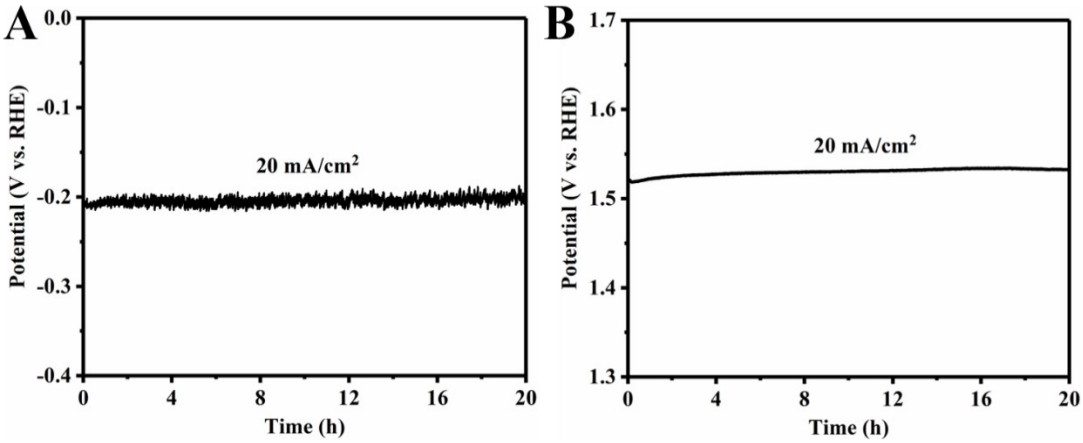

Fig. S4. Chronopotentiometry curves for NC@CoN/Cu_3N/CF in (A) HER and (B) OER side at a constant current density of 20 mA/cm^2.

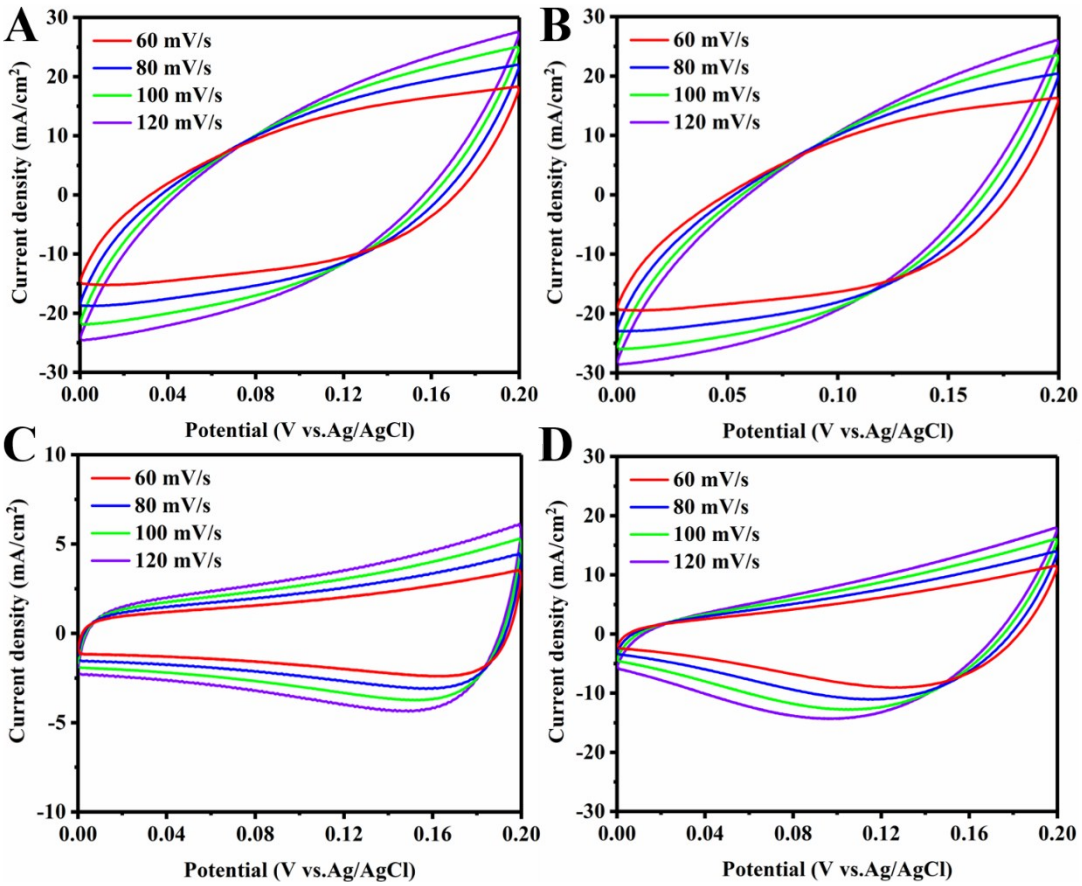

Fig. S5. CV curves at various scan rates of (A) NC@CoN/Cu_3N/CF, (B) CoN/Cu_3N/CF, (C) CoN/CF and (D) Cu_3N/CF.

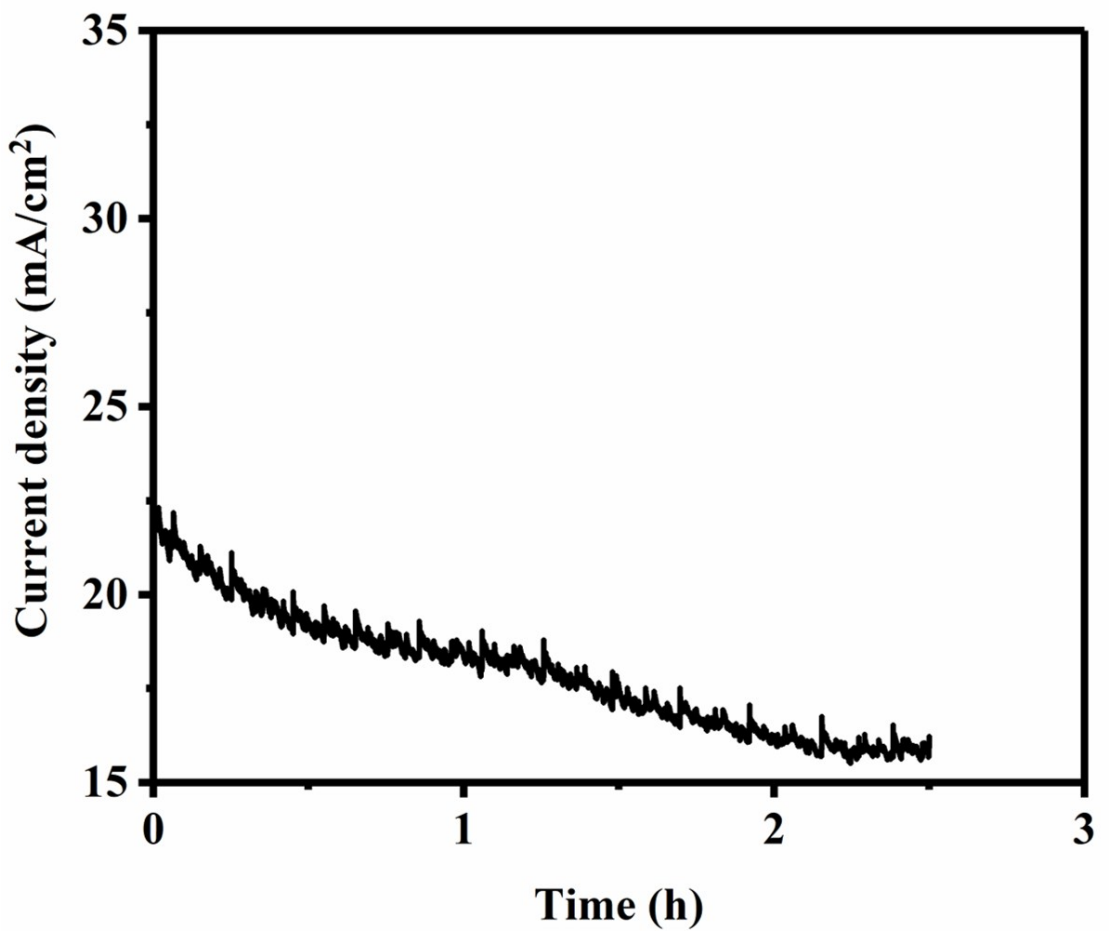

Fig. S6. Stability test of CoN/Cu_3N/CF with specified voltage (j = 20 mA/cm^2) for 2.5 h

Table S3. Comparison of the OWP activity of NC@CoN/Cu_3N/CF with that of some recently reported bifunctional non-precious based electrocatalysts.

Electrocatalyst	OWP potential (V) at 10 mA/cm^2	Ref.
NC@CoN/Cu_3N/CF	1.62	This work
Cu@CoS_x/CF	1.50	28
NiN_x (HER) $CoNi(OH)_x$ (OER)	1.65	30
TiO_2@Co_9S_8	1.56	31
NC@$CuCoN_x$/CF	1.62	38
$Co_5Mo_{1.0}P$ NSs@NF (HER) $Co_5Mo_{1.0}O$ NSs@NF (OER)	1.68	45
NESSP (HER) NESS (OER)	1.74	46
Co-P film/CF	~1.62	47
$CuCo_2O_4$/NF	1.61	48

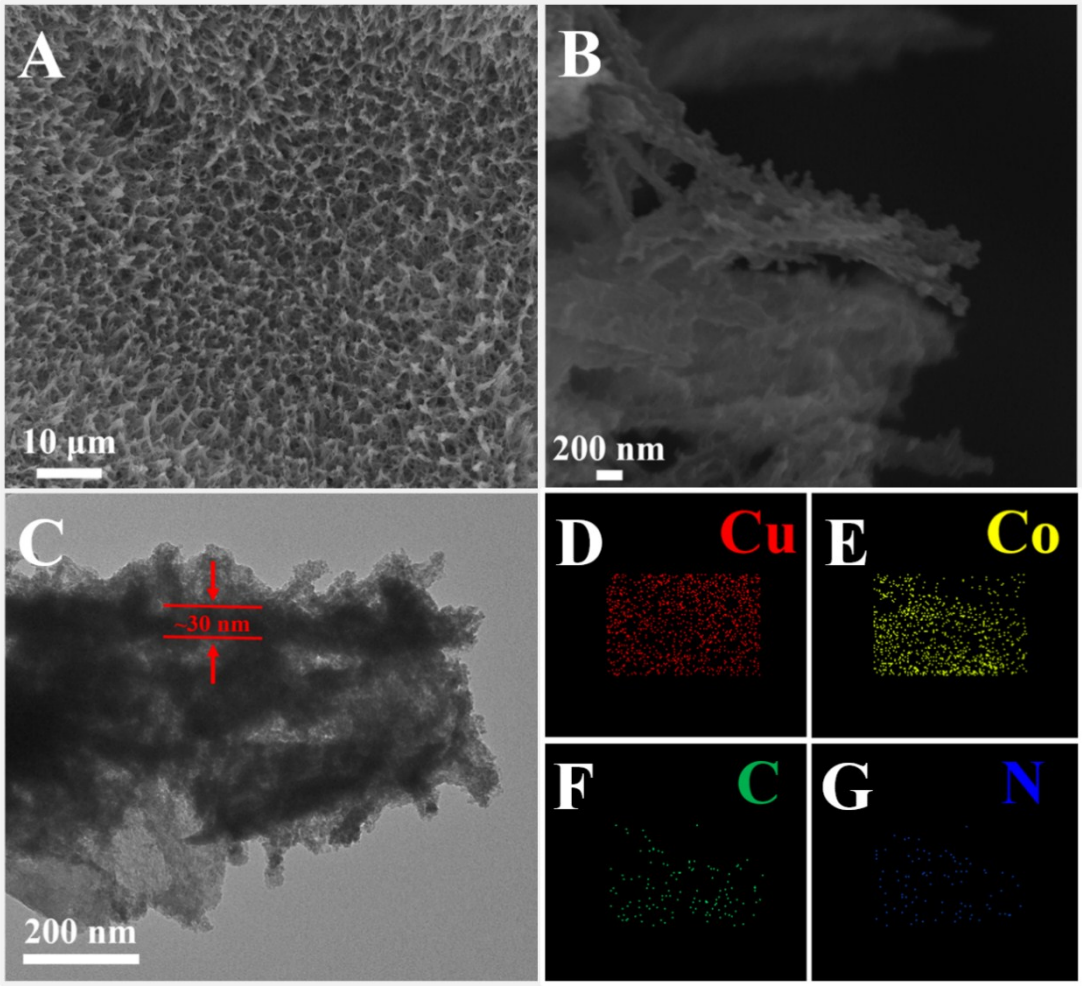

Fig. S7. (A) Low magnification, (B) high magnification SEM images, (C) TEM image and (D) mapping analysis of the NC@CoN/Cu_3N/CF (OER side) after stability test.

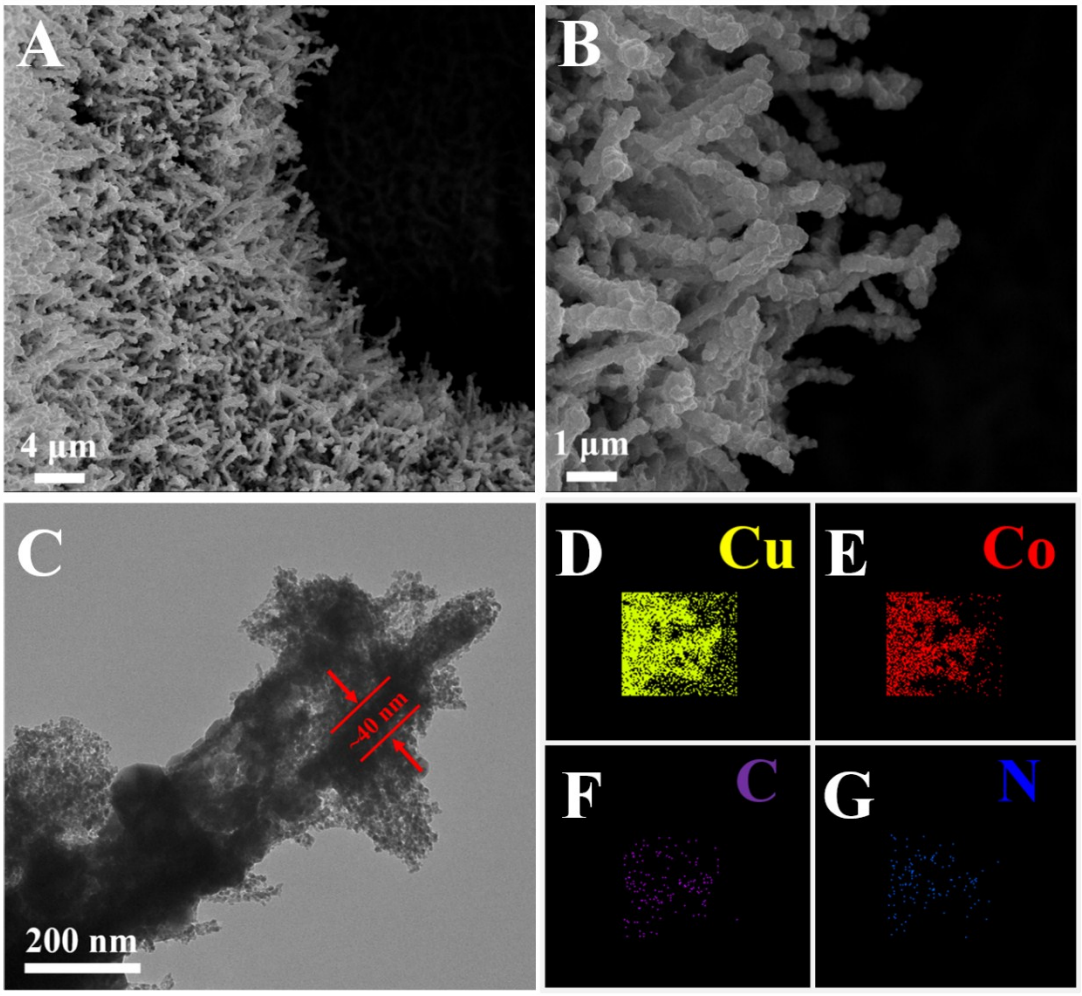

Fig. S8. (A) Low magnification, (B) high magnification SEM images, (C) TEM image and (D) mapping analysis of the NC@CoN/Cu_3N/CF (HER side) after stability test.

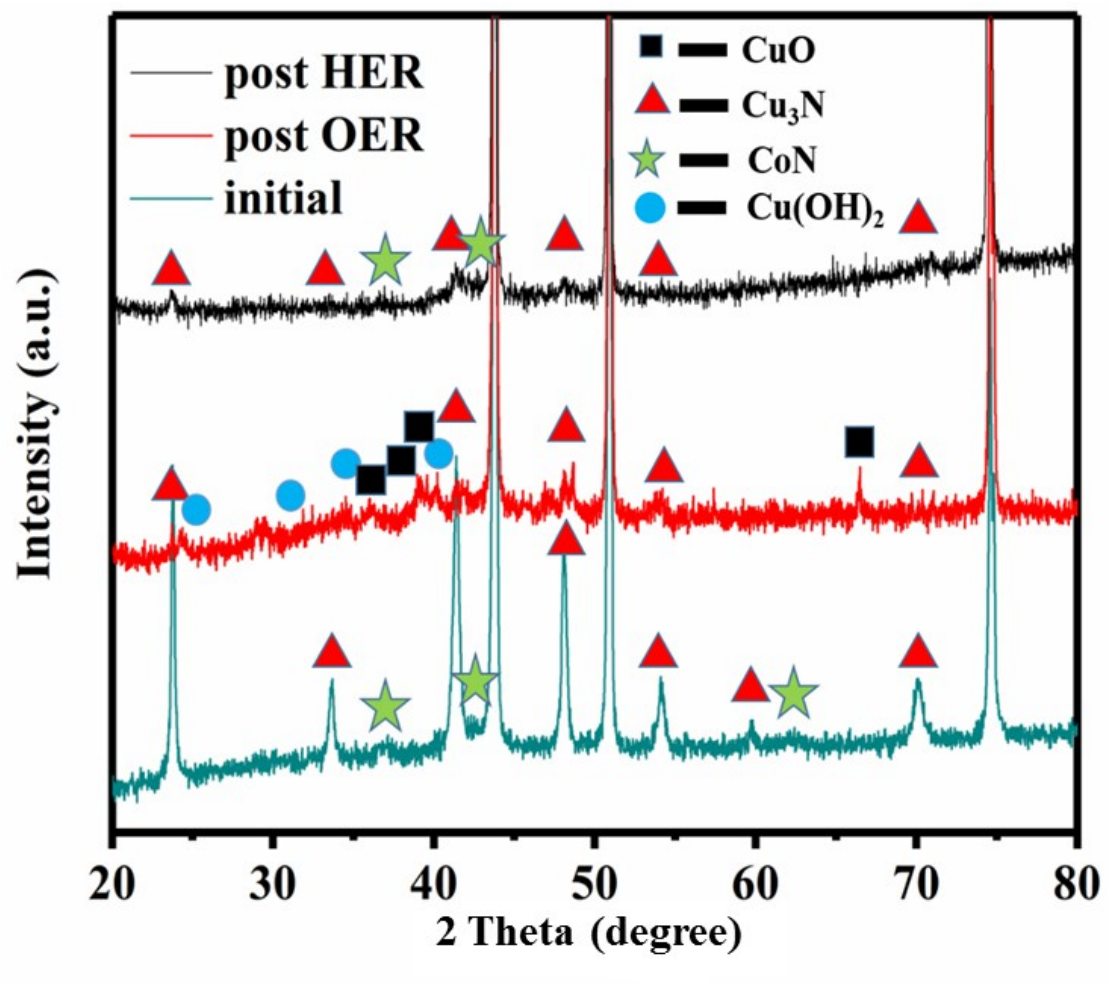

Fig. S9. XRD pattern of NC@CoN/Cu_3N/CF after HER and OER process.

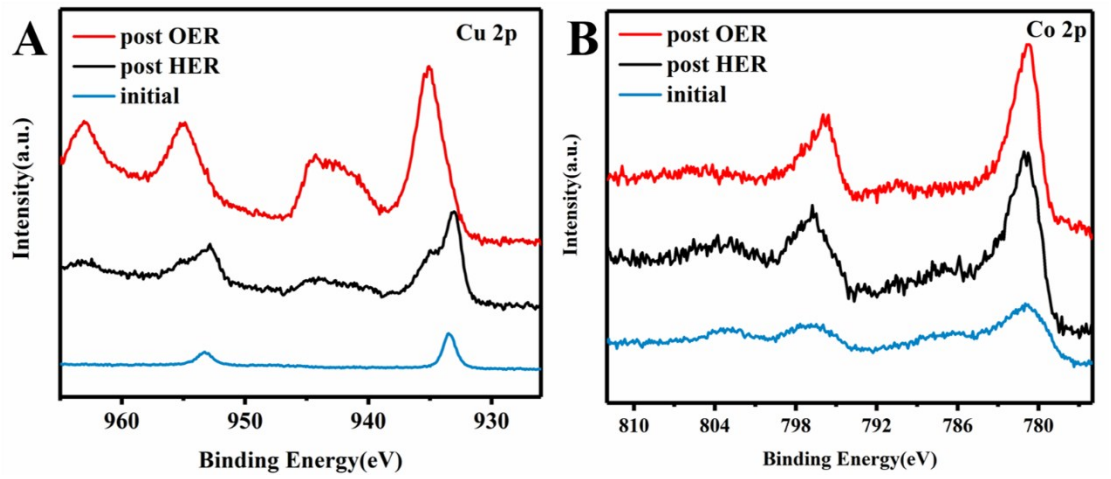

Fig. S10. XPS of Cu (A) and Co (B) envelope in NC@CoN/Cu_3N/CF after HER and OER process.