Supporting Information

Electrocatalysts via metal-polyphenol assembly strategy for efficient nitrate reduction

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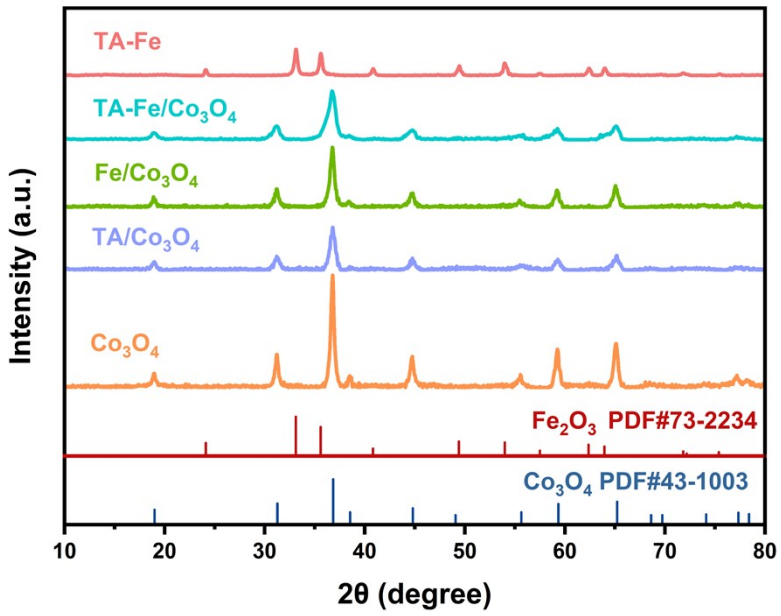

Fig. S1 Comparison of XRD patterns of Co_3O_4, TA/Co_3O_4, Fe/Co_3O_4, TA-Fe/Co_3O_4, and TA-Fe.

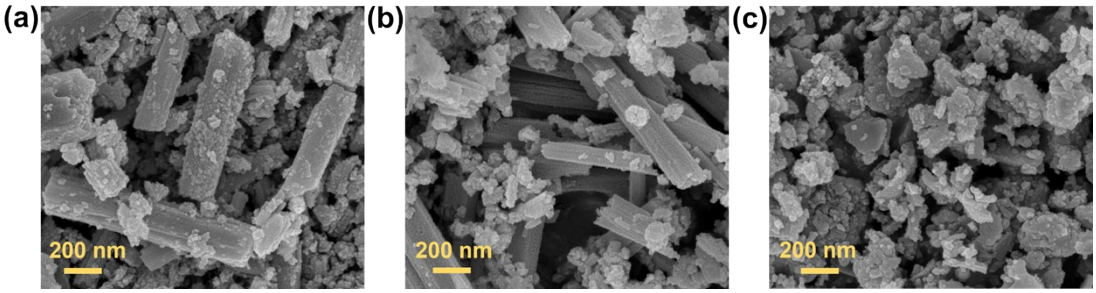

Fig. S2 SEM images of (a) TA/Co_3O_4, (b) Fe/Co_3O_4, and (c) TA-Fe.

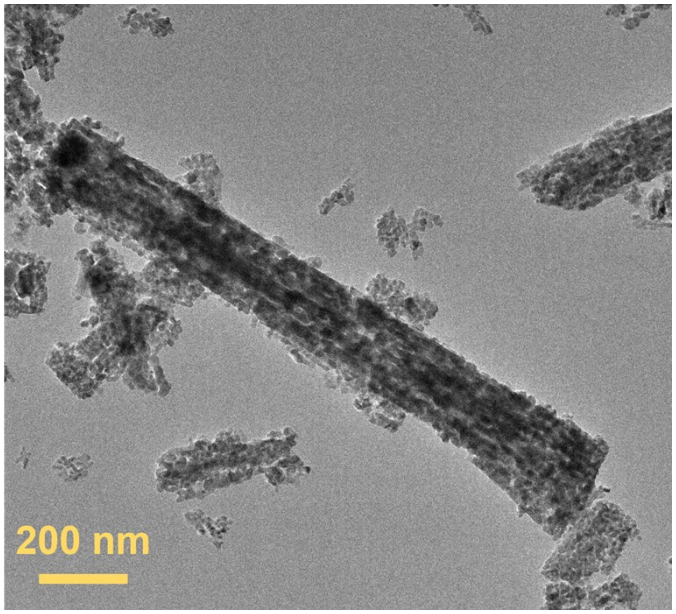

Fig. S3 TEM image of Co_3O_4.

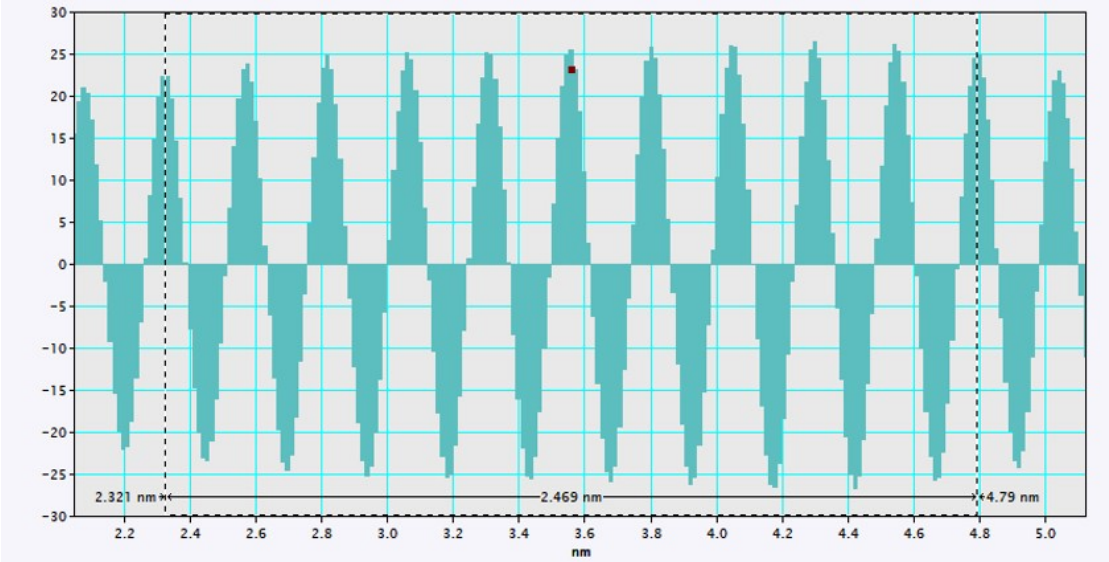

Fig. S4 Corresponding interplanar spacing profile of Co_3O_4 in TA-Fe/Co_3O_4.

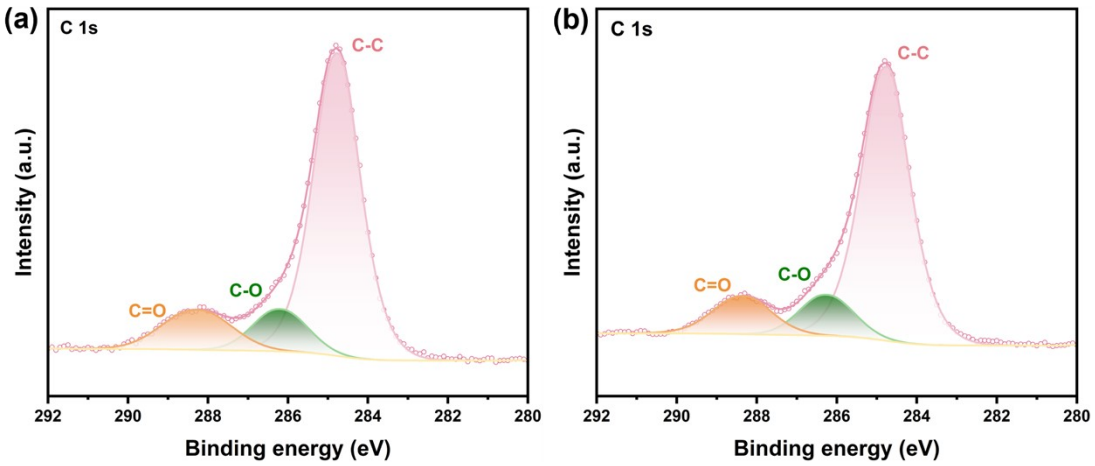

Fig. S5 C 1s XPS spectra of (a) Co_3O_4 and (b) TA-Fe/Co_3O_4.

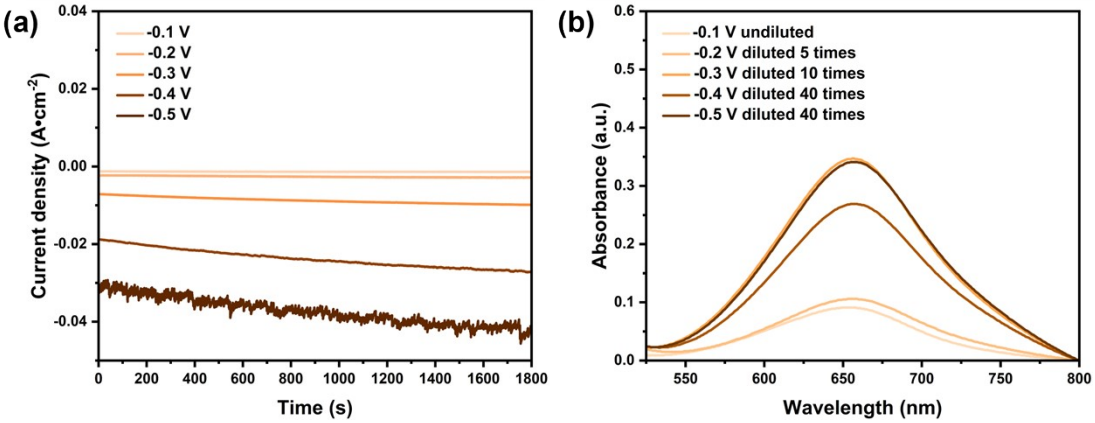

Fig. S6 (a) I-t curves and (b) corresponding UV-vis spectra of the electrolyte after electrolysis of Co_3O_4 at different potentials.

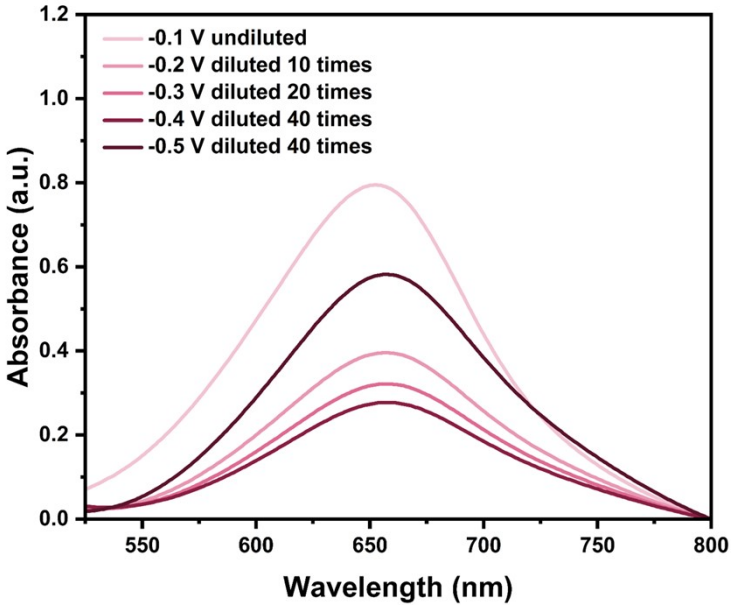

Fig. S7 UV-vis spectra of the electrolyte after electrolysis of TA-Fe/Co_3O_4 at different potentials.

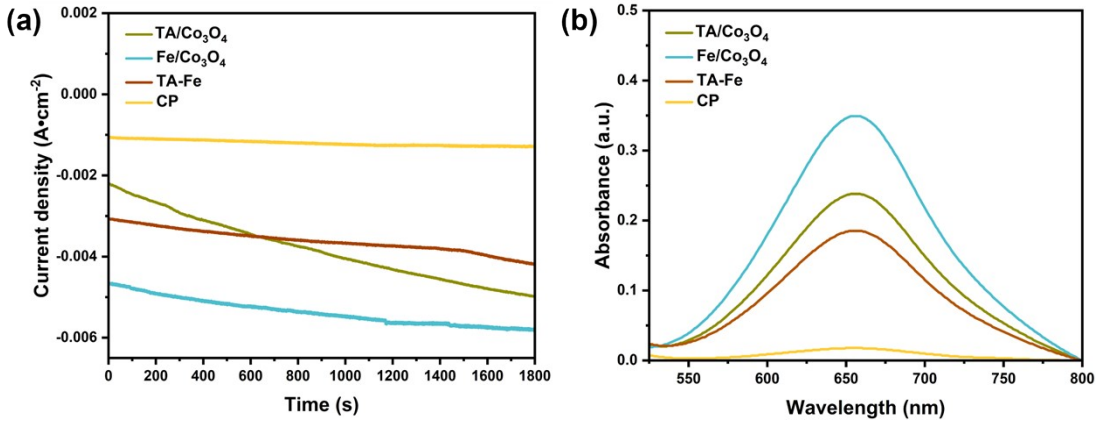

Fig. S8 (a) I-t curves and (b) corresponding UV-vis spectra of the electrolyte after electrolysis of TA/Co_3O_4, Fe/Co_3O_4, TA-Fe, and CP at -0.2 V vs. RHE.

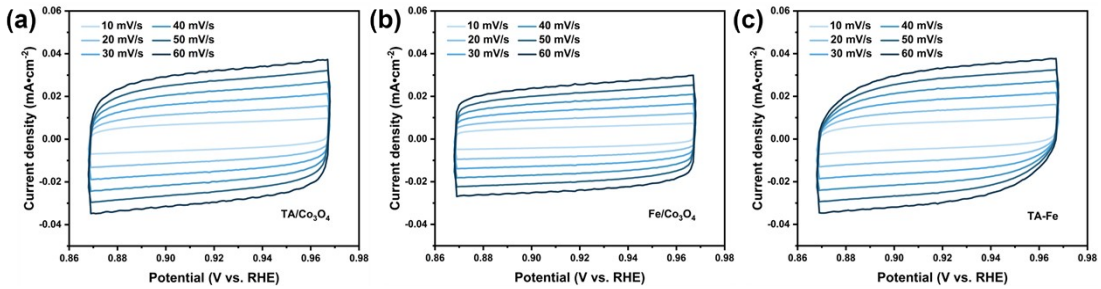

Fig. S9 CV curves at different scan rates of (a) TA/Co_3O_4, (b) Fe/Co_3O_4, and (c) TA-Fe.

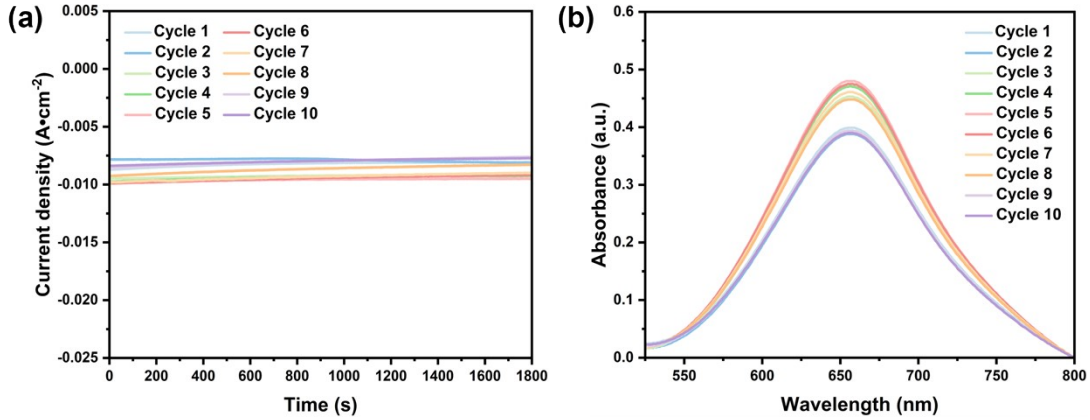

Fig. S10 (a) IT curves and (b) corresponding UV-vis absorbance spectra of the electrolyte after electrolysis of the stability test of TA-Fe/Co_3O_4 for 10 cycles at-0.2 V vs. RHE.

Table S1. ICP-OES test results of TA-Fe/Co_3O_4.

Catalysts	Co (wt.%)	Fe (wt.%)
TA-Fe/Co_3O_4	54.59	8.50

Table S2. Valence state distribution of Co in the catalyst (%).

Catalysts	Co^{3+}	Co^{2+}	Co^{3+}/ Co^{2+}

Co_3O_4	36.98	63.02	0.59
TA-Fe/Co_3O_4	34.16	65.84	0.52

Table S3. Comparison of catalytic activity for TA-Fe/Co_3O_4 with other NO_3RR electrocatalysts

Catalysts	**Electrolytes**	**Highest NH_3 yield rate/ μmol h^{-1} cm^{-2}**	**Highest FE/%**	**Ref.**
TA-Fe/Co_3O_4	1 M KOH+0.1 M NO_3^-	206.50 (-0.5 V vs. RHE)	94.36 (-0.2 V vs. RHE)	This work
FOSP-Cu-0.1	0.5 M Na_2SO_4 +0.1 M NO_3^-	101.4 (-0.266 V vs. RHE)	93.91 (-0.266 V vs. RHE)	1
Cu-Co_3O_4 /NF	0.2 M K_2SO_4+2 mM NO_3^-	137 (-0.83V *vs.* RHE)	92.4 (-0.53V vs. RHE)	2
RuOx-Co_3O_4	0.1 M $NaSO_4$+0.5 M NO_3^-	210.5 (-0.6V vs. RHE)	89.7 (-0.6 V vs. RHE)	3
Co-Fe_2P@NiP_2	0.2 M Na_2SO_4 +50 mM NO_3^-	395 (-0.7V vs. RHE)	97.2 (-0.6V vs. RHE)	4
Co_3O_4 /TiO_2/Ti	1 M NaOH + 20 mM NO_3^-	93.3 (-0.4V vs. RHE)	80.0 (-0.3V vs. RHE)	5
Cu_2O NCs	1 M NaOH + 14 mM NO_3^-	149 (-0.3V vs. RHE)	94 (-0.3V vs. RHE)	6
$CoNiO_2$	0.1 M NaOH +500 ppm NO_3^-	246.5 (-0.65V vs. RHE)	97.7 (-0.45V vs. RHE)	7
B-Co_3O_4 /TM	0.1 M NaOH+0.1 M NO_3^-	561.7 (-0.8V vs. RHE)	94.7 (-0.7V vs.RHE)	8
Cu/Cu_2O@C	0.1 M KOH+0.1 M NO_3^-	158.66 (-0.6V vs.RHE)	76.97 (-0.6V vs.RHE)	9
Ru@C_3N_4/Cu	0.5 M Na_2SO_4+200 ppm NO_3^-	249	91.3	10

Catalysts	Electrolytes	Highest NH_3 yield rate/ μmol h^{-1} cm^{-2}	Highest FE/%	Ref.
		(-0.9V vs. RHE)	(-0.8V vs. RHE)	

Table S4. Comparison of the catalytic activity of different catalysts at -0.2 V vs. RHE.

Catalysts	Electrolytes	NH_3 Yield rate/ μmol h^{-1} cm^{-2}	FE/%
CP	1M KOH +0.1M KNO_3	0.12	2.12
Co_3O_4		4.456	36.54
TA/Co_3O_4		10.47	58.90
Fe/Co_3O_4		15.46	61.70
TA-Fe		8.02	47.59
TA-Fe/Co_3O_4		35.09	94.36

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