

Supplementary Information

Self-assembly of graphene quantum dots into 2D textile-derived Janus Fe/FeO_x@C for oxygen electrocatalysis

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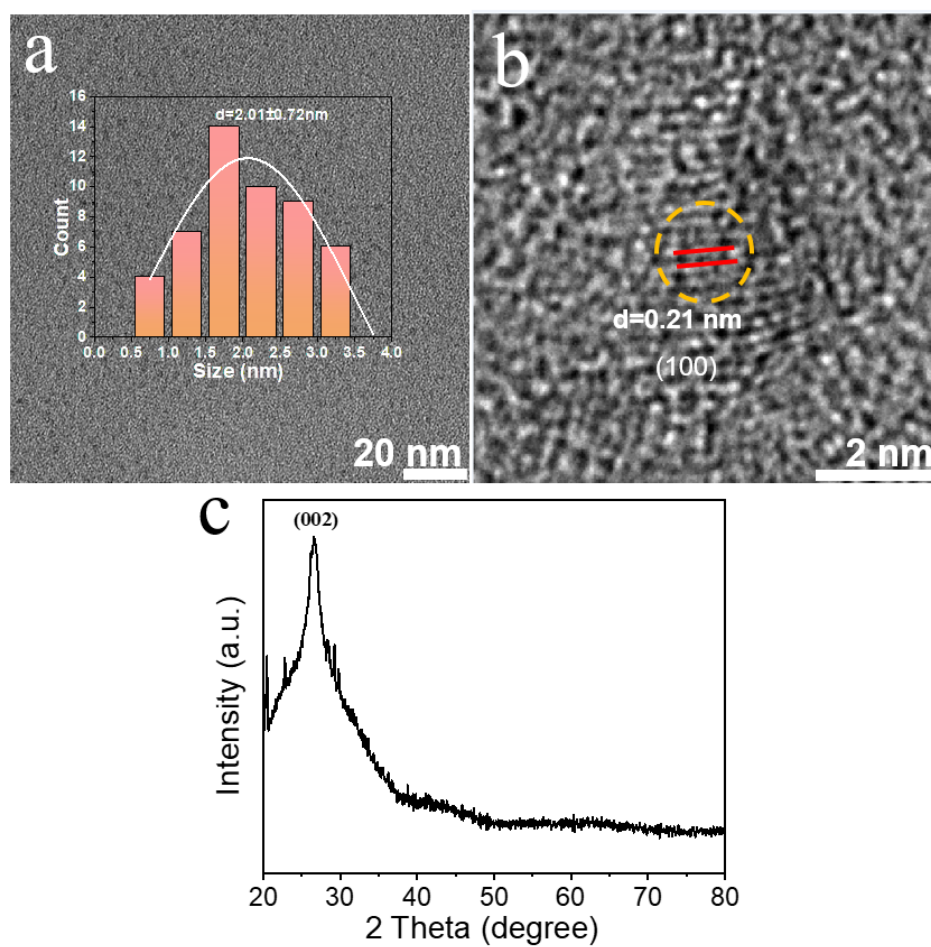


Figure S1. (a) TEM image with size distribution (inset), (b) HRTEM image, (c) XRD pattern of GQDs.

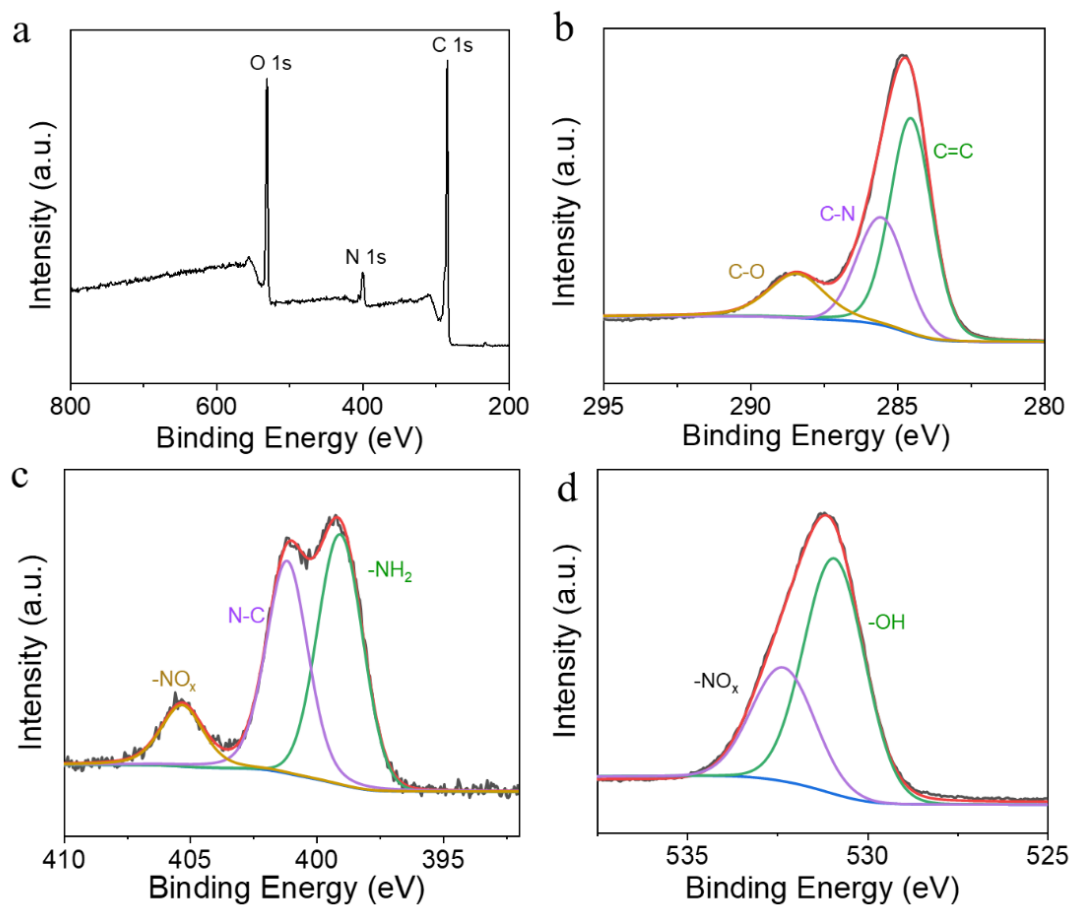


Figure S2. (a) XPS survey spectrum, (b) C 1s, (c) N 1s, and (d) O 1s spectra of GQDs.

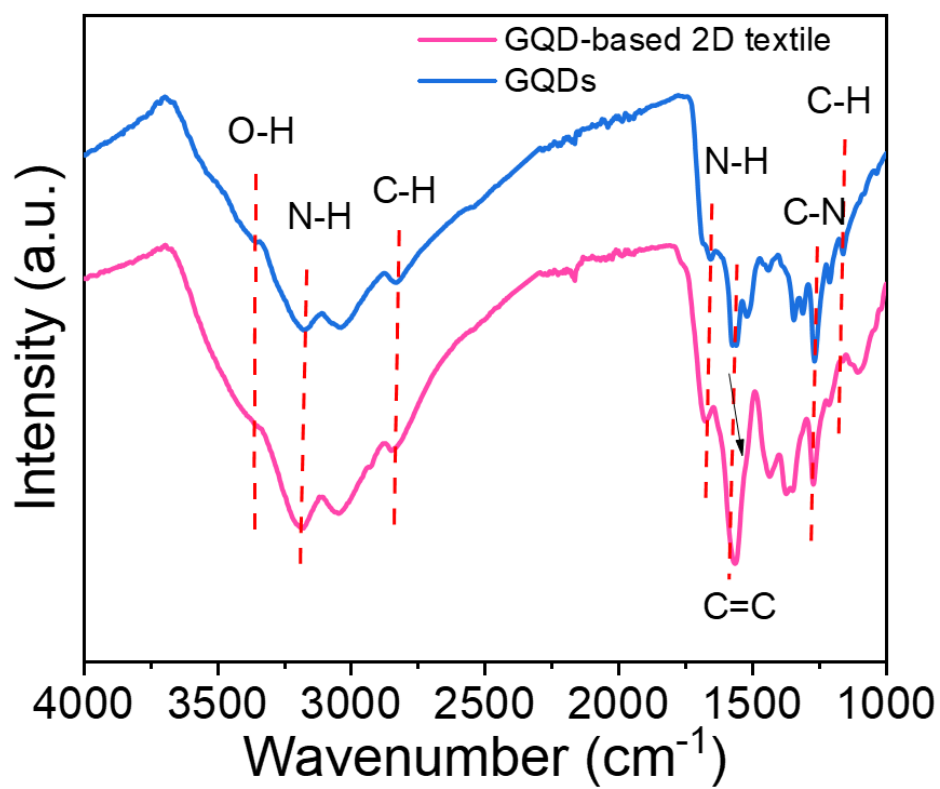


Figure S3. FT-IR spectra of GQDs and GQD-based 2D textile.

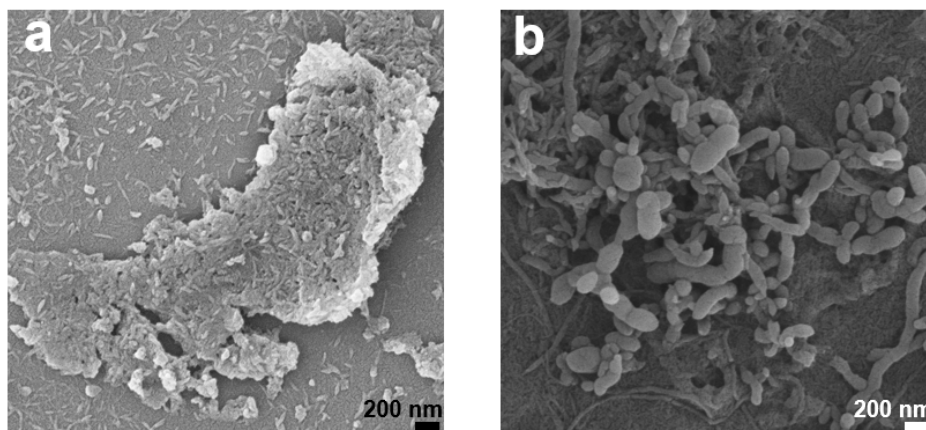


Figure S4. SEM images of the self-assembly of GQDs (a) at pH=1, (b) at pH=6.

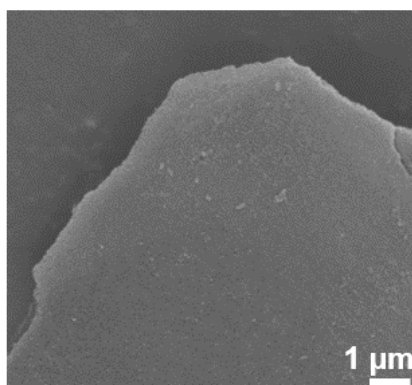


Figure S5. SEM image of 2D textile with addition of Fe ions.

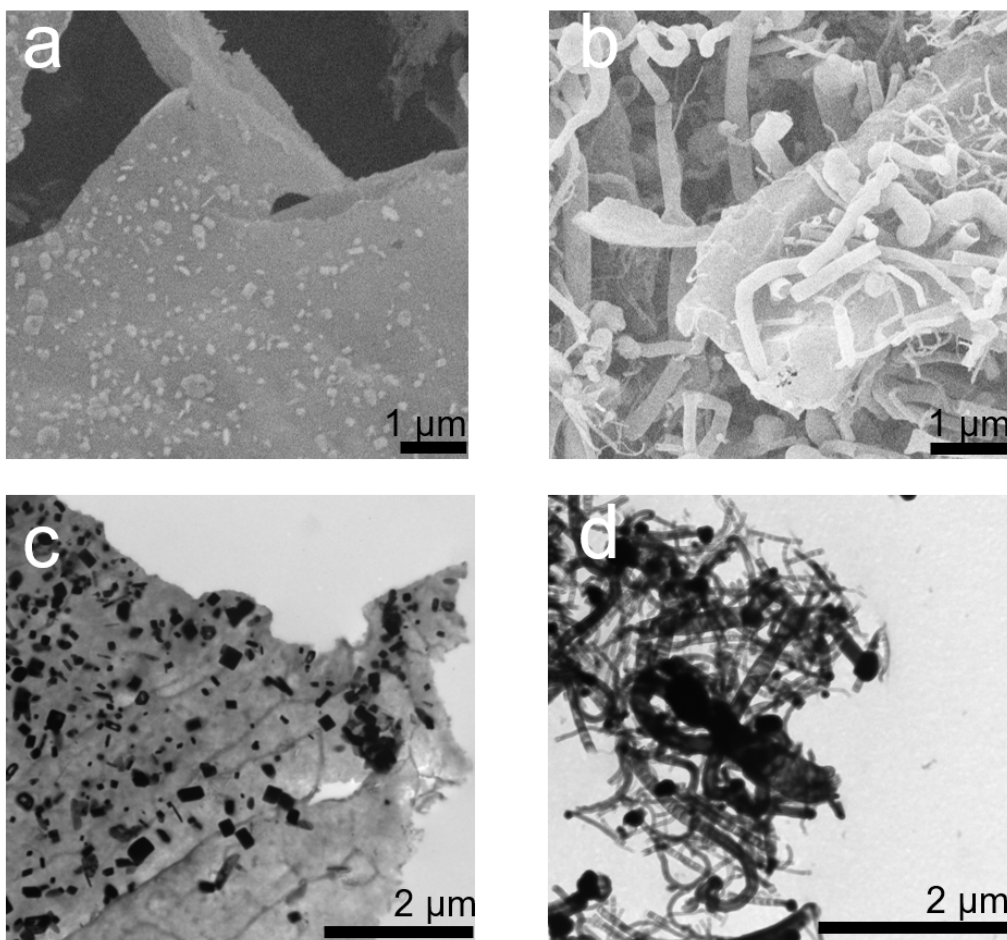


Figure S6. SEM image of (a) FeNC-700 and (b) FeNC-900, TEM image of (c) FeNC-700 and (d) FeNC-900.

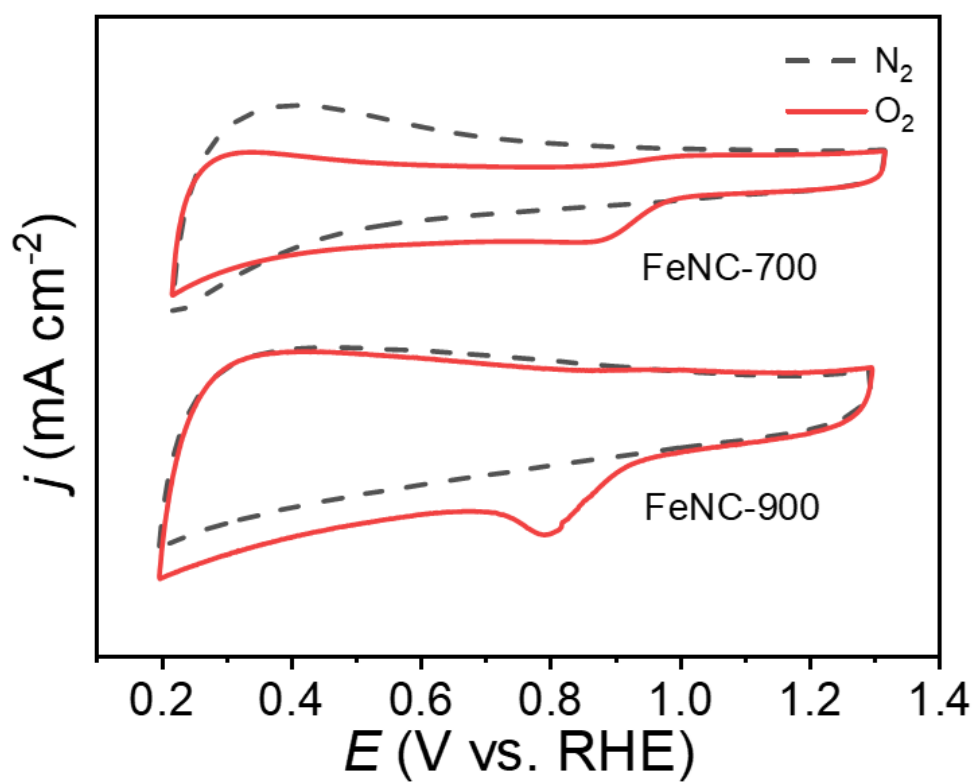


Figure S7. Cyclic voltammetry (CV) curves of FeNC-700 and FeNC-900 catalysts in Ar- (dotted lines) and O_2 (solid lines)-saturated 0.1 M KOH electrolyte.

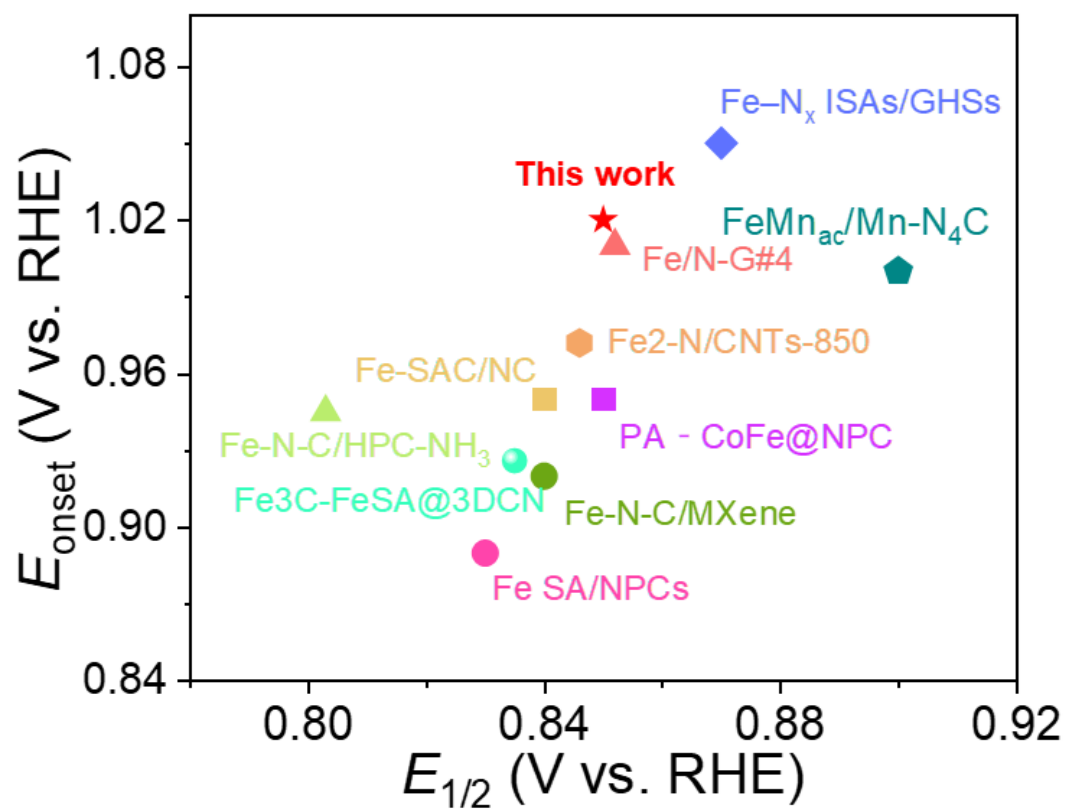


Figure S8. ORR performance comparison with Fe-based catalysts.

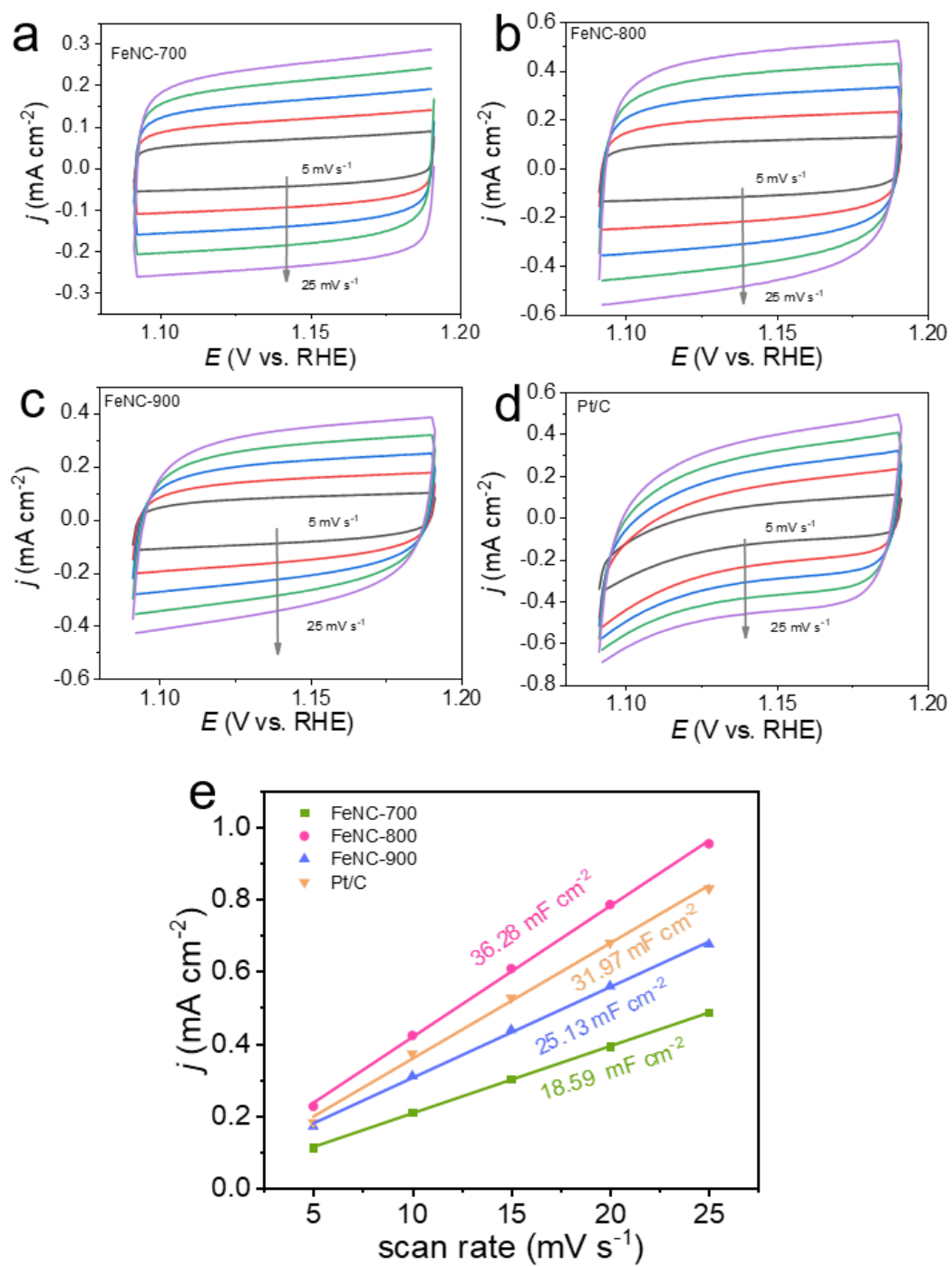


Figure S9. CVs for (a) FeNC-700, (b) FeNC-800, (c) FeNC-900, and (d) Pt/C at scan rates from 5 to 25 mV s^{-1} . (e) Calculated C_{dl} values.

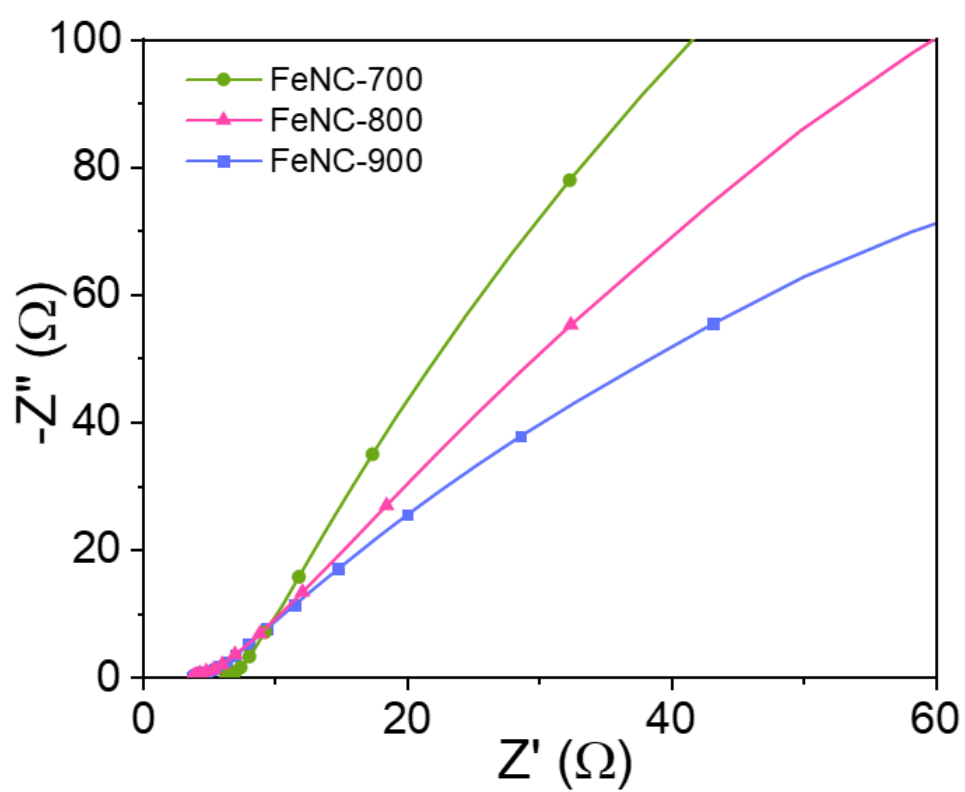


Figure S10. Nyquist plots of FeNC-700, FeNC-800 and FeNC-900 in 1.0 M KOH electrolyte.

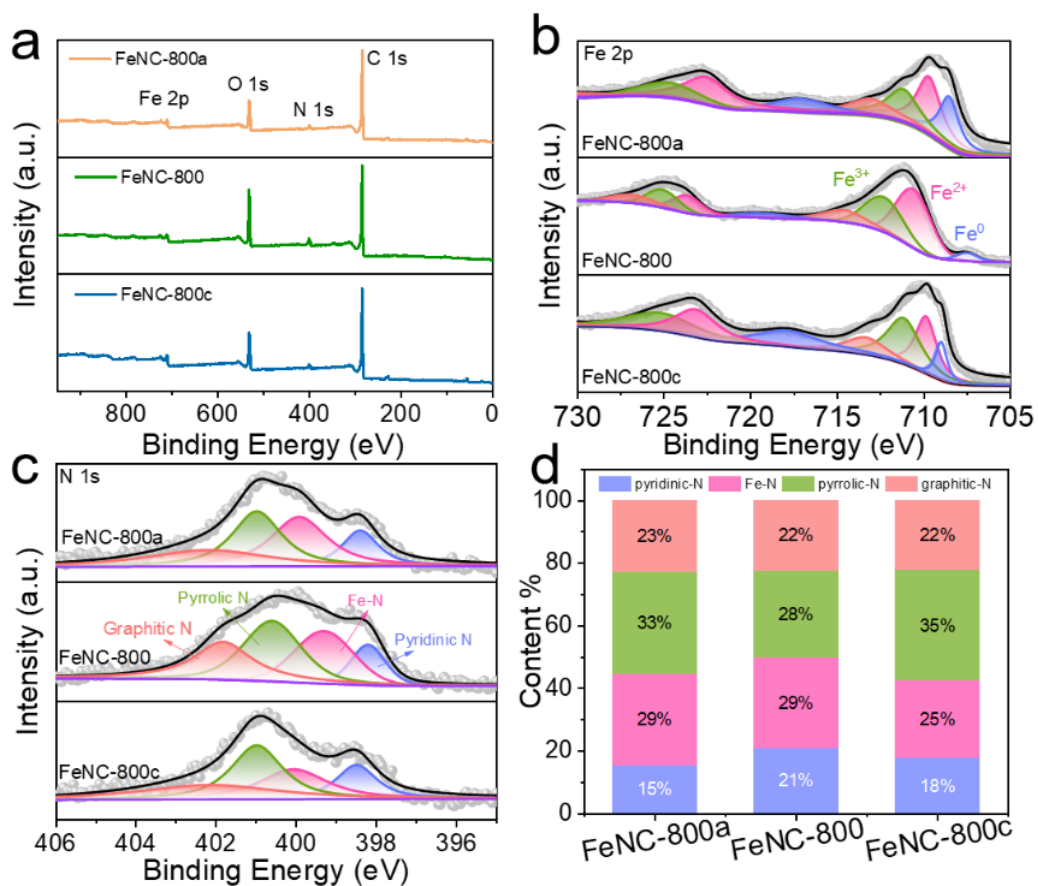


Figure S11. (a) The survey XPS spectra, (b) Fe 2p, (c) N 1s spectra, and (d) analysis of various N-types content of FeNC-800a, FeNC-800, and FeNC-800c.

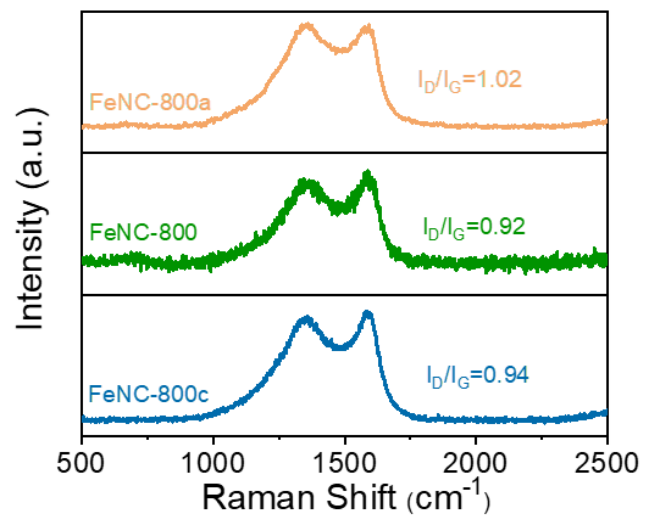


Figure S12. Raman patterns of FeNC-800a, FeNC-800 and FeNC-800c.

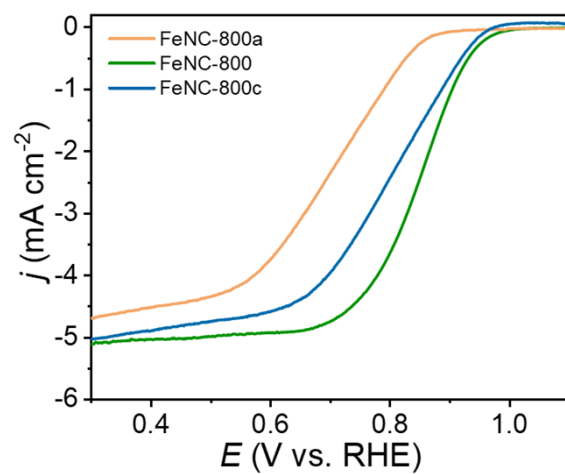


Figure S13. LSV curves of FeNC-800a, FeNC-800 and FeNC-800c.

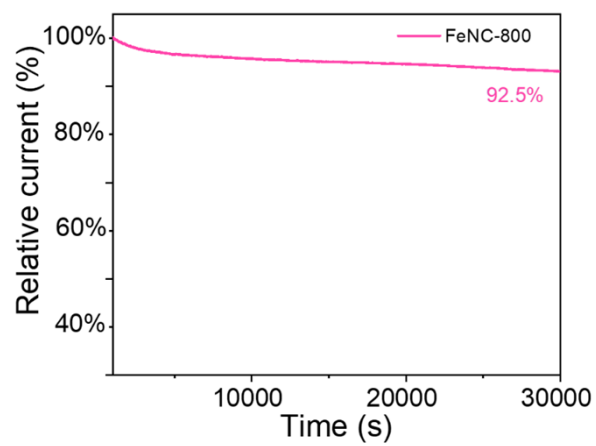


Figure S14. IT curve of FeNC-800.

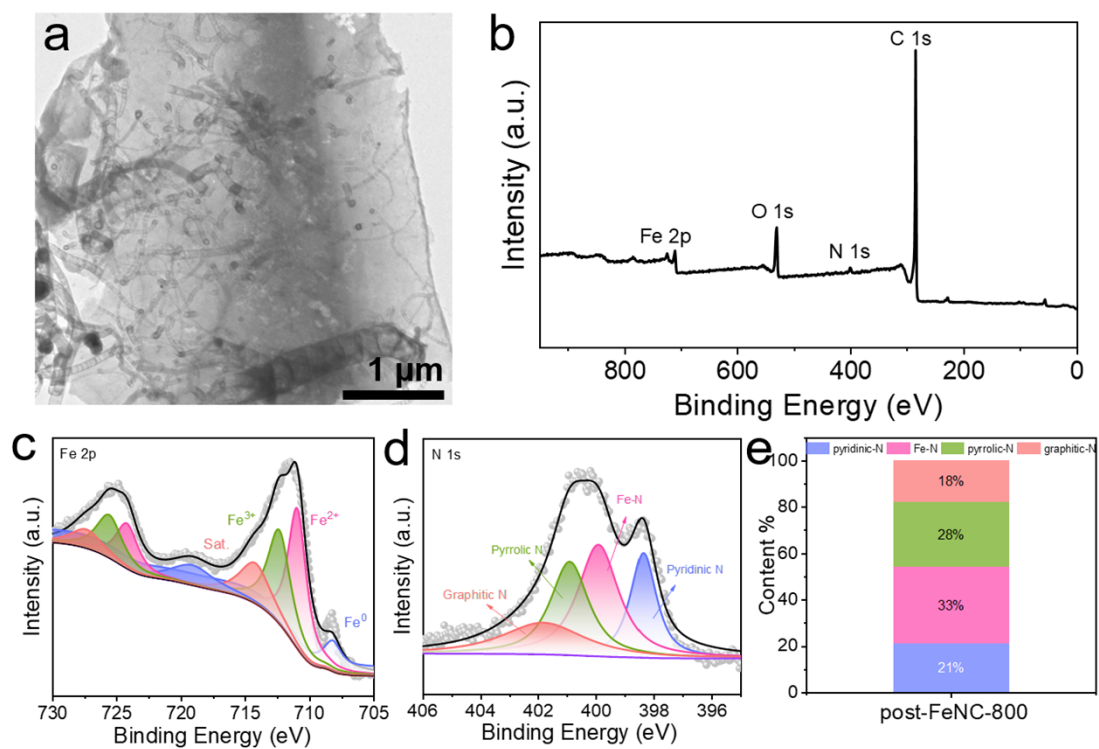


Figure S15. (a) TEM image, (b) XPS survey spectrum, high resolution XPS spectrum of (c) Fe 2p, (d) N 1s, and (e) analysis diagram of various N-type content of the post-FeNC-800 catalyst after electrochemical operation.

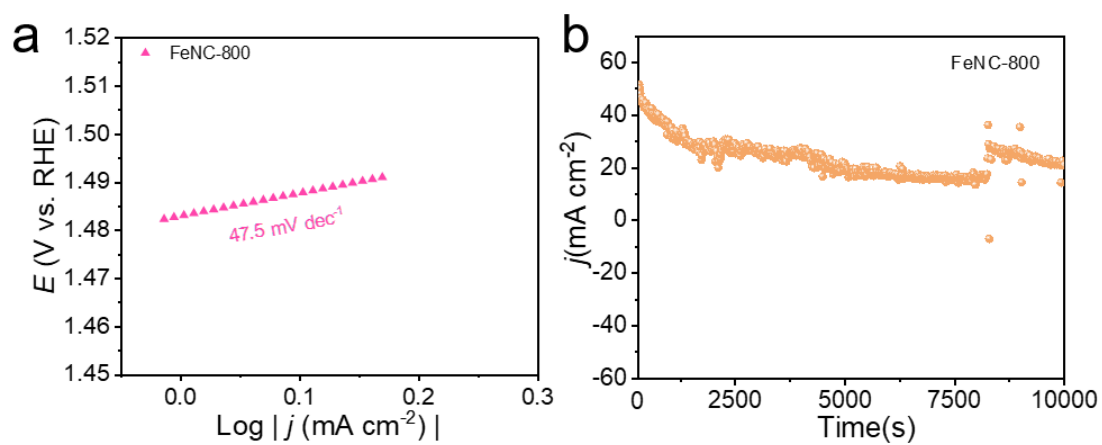


Figure S16. (a) Tafel slopes of FeNC-800. (b) OER stability test of FeNC-800.

Table S1. The content of C, N, O and Fe in FeNC catalysts from XPS analysis.

Catalysts	C (at%)	N (at%)	O (at%)	Fe (at%)
FeNC-700	81.95	4.16	11.2	2.69
FeNC-800	74	4.79	17.34	3.86
FeNC-900	69.81	4.65	21.2	4.33

Table S2. A comparison table of the ORR activity between this work and recently reported Fe-based catalysts in alkaline medium.

Materials	$E_{1/2}$ (V) in 0.1 M KOH	E_{onset} (V) in 0.1 M KOH	References
FeNC-800	0.85	1.02	This work
Fe ₃ C-FeSA@3DCN	0.835	0.926	[1]
FNSNC73-800	0.79	-	[2]
Fe ₂ -N/CNTs-850	0.846	0.972	[3]
Fe/Ni (1:3)-NG	0.842	-	[4]
Fe SA/NPCs	0.83	0.89	[5]
Fe@MET-M	0.895	-	[6]
PA-CoFe@NPC	0.85	0.95	[7]
Fe/N-G#4	0.852	1.01	[8]
Fe-KJB-3-60A	0.90	-	[9]
Fe-N _x ISAs/GHSs	0.87	1.05	[10]
FeS/FeNSC	0.91	-	[11]
Fe-SAC/NC	0.84	0.95	[12]
AC-N-Fe	0.76	0.87	[13]
Fe-N-C/HPC-NH ₃	0.803	0.945	[14]
Fe-N-C/MXene	0.84	0.92	[15]
FeMn _{ac} /Mn-N ₄ C	0.90	1.00	[16]
FePNC	0.90	-	[17]

References

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