

Electronic Supplementary Information

Hierarchically porous Fe-N-C nanospindles derived from porphyrinic coordination network for Oxygen Reduction Reaction

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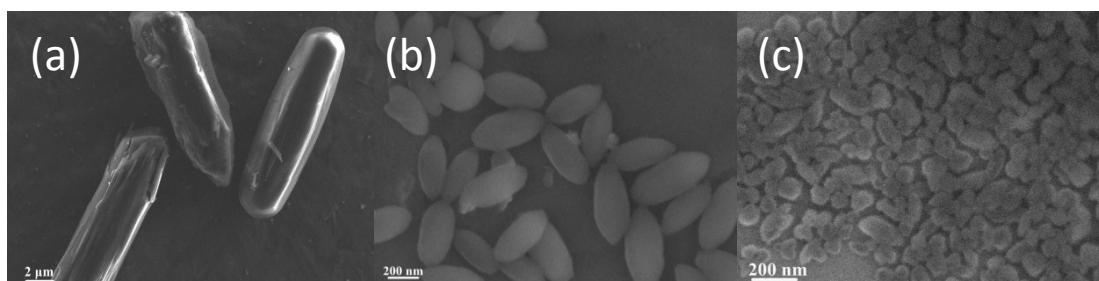


Figure S1. SEM images of (a) PCMMR, (b) PCNNS and (c) PCNNP.

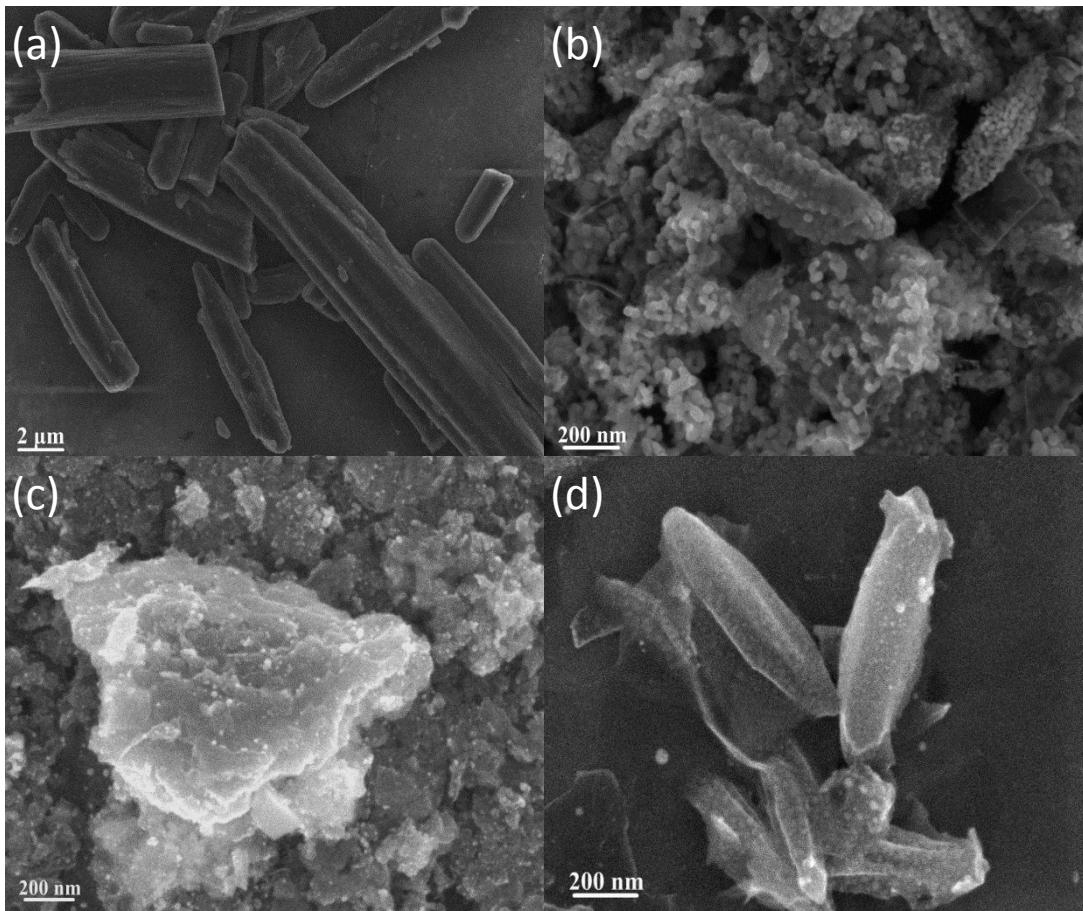


Figure S2. SEM images of (a) PCNMR-Phen-NaCl-H₂SO₄, (b) PCNNS-Phen-NaCl-H₂SO₄, (c) PCNNP-Phen-NaCl-H₂SO₄ and (d) PCNNS-Phen-NaCl.

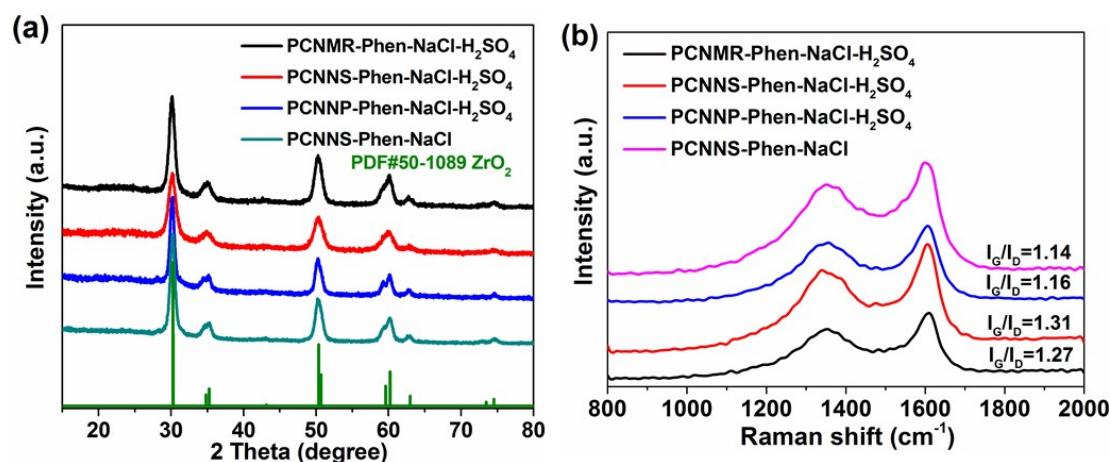


Figure S3. (a) XRD patterns and (b) Raman spectra of the Fe-N-C catalysts. (The vertical lines in (a) show the standard peak positions for ZrO₂.)

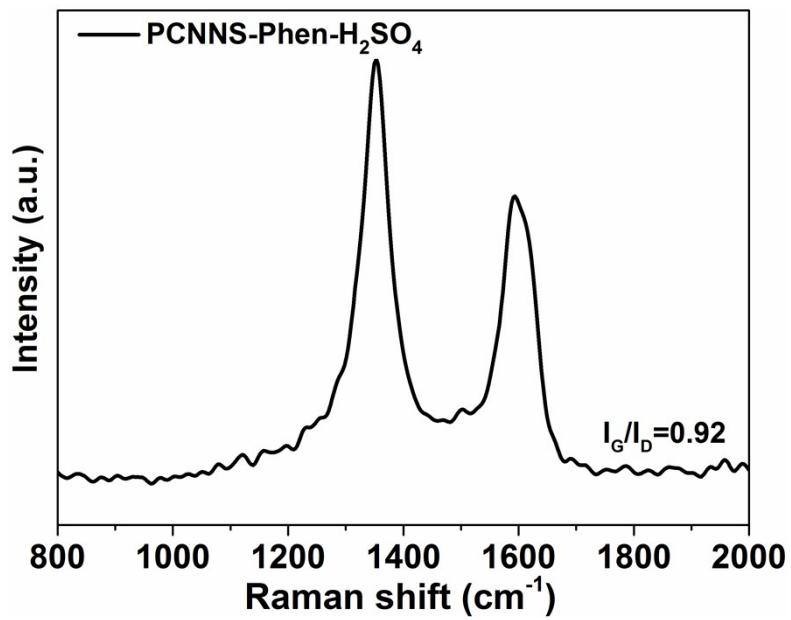


Figure S4. Raman spectra of PCNNS-Phen- H_2SO_4 .

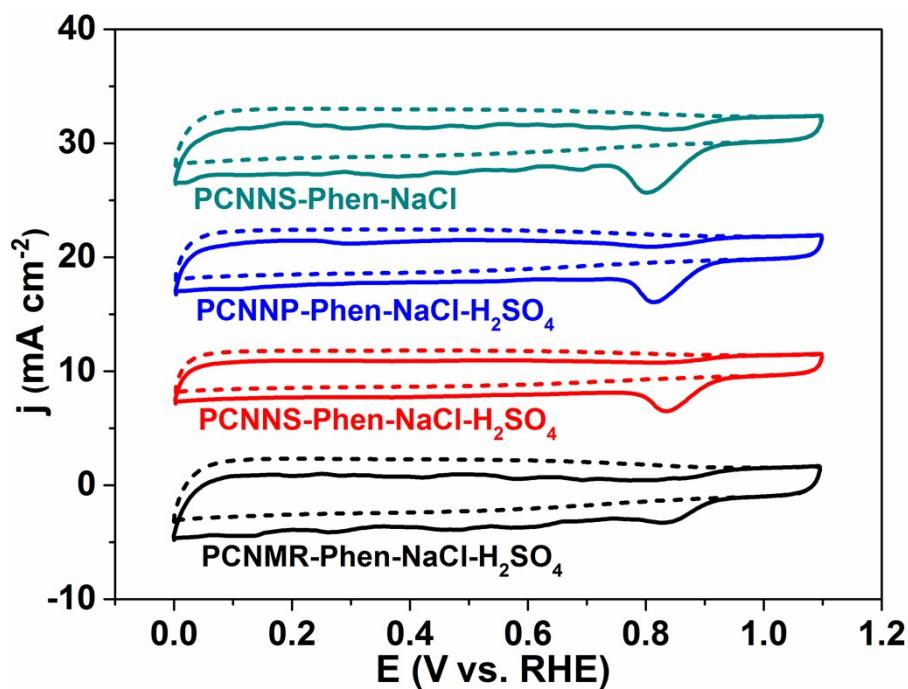


Figure S5. CV curves of Fe-N-C series in Ar- and O_2 -saturated 0.1 M KOH solution at a scan rate of 50 mV s⁻¹. (Dash line is the CV curve obtained in Ar-saturated solution)

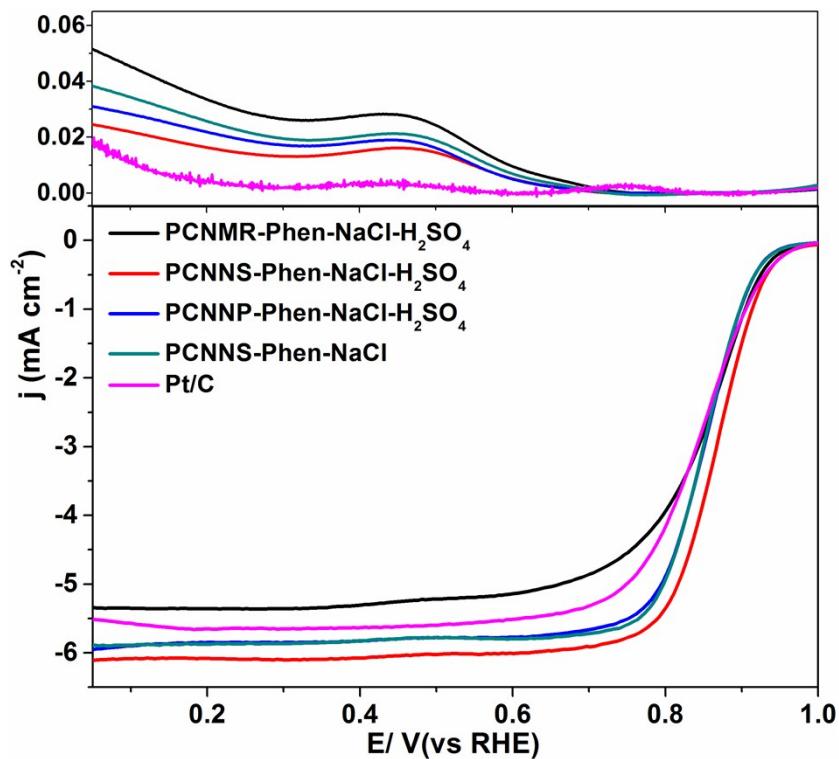


Figure S6. The RRDE voltammograms of Fe-N-C series in O₂-saturated 0.1 M KOH solution.

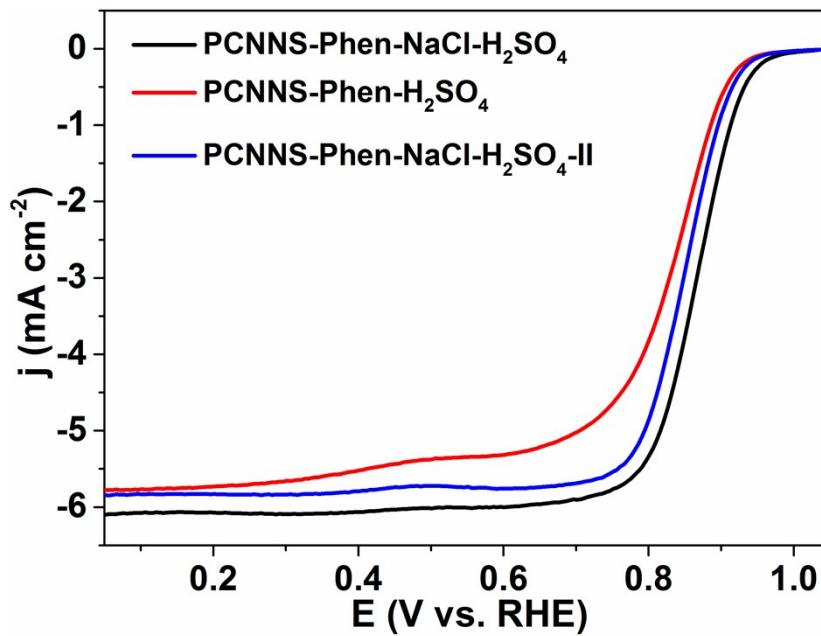


Figure S7. ORR polarization curves of other Fe-N-C series for a compassion obtained at an electrode rotating speed of 1600 rpm and a scan rate of 5 mV s^{-1} in O₂-saturated 0.1 M KOH solution.

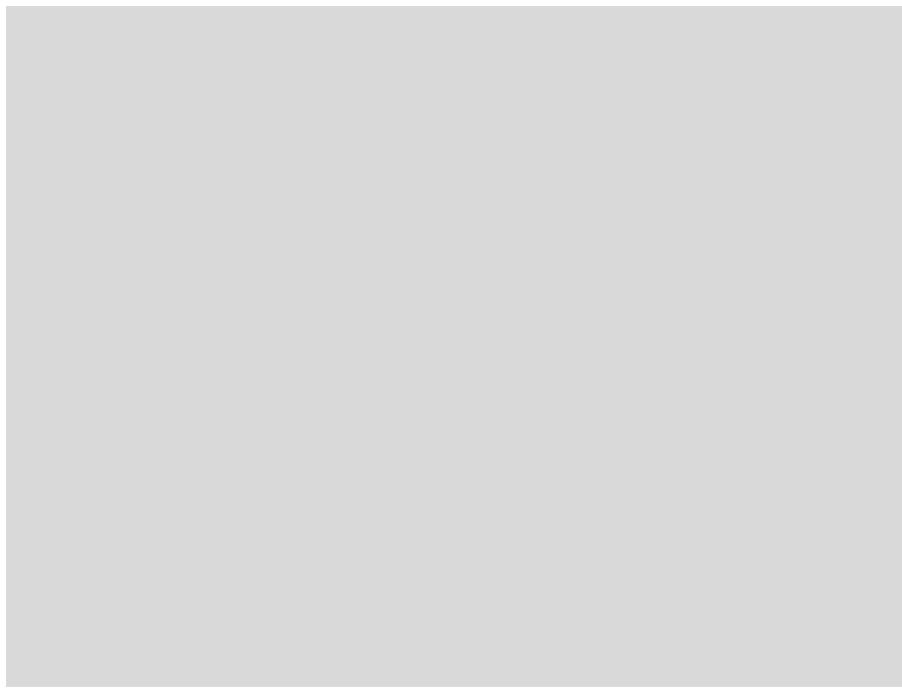


Figure S8. CV curves of Fe-N-C series in Ar- and O₂-saturated 0.1 M HClO₄ solution at a scan rate of 50 mV s⁻¹. (Dash line is the CV curve obtained in Ar-saturated solution)

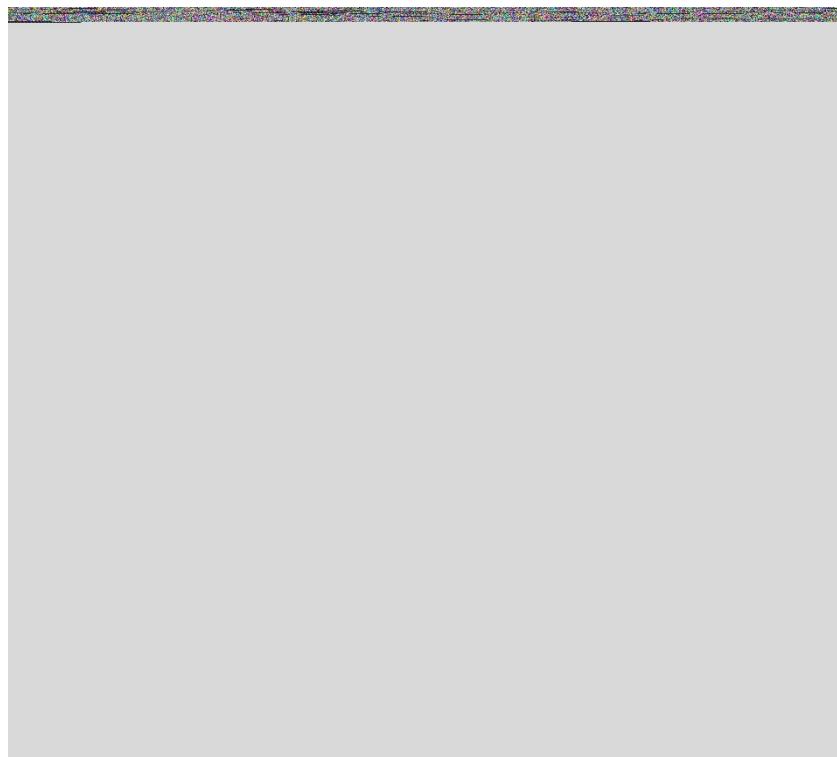


Figure S9. The RRDE voltammograms of Fe-N-C series in O₂-saturated 0.1 M HClO₄ solution.

Table S1. Comparison of ORR electrocatalytic performances between PCNNS-Phen-NaCl-H₂SO₄ and those reported Fe-N-C catalysts in alkaline medium.

Catalyst	Catalyst loading ($\mu\text{g cm}^{-2}$)	Onset potential (V vs RHE)	Half wave potential (V vs RHE)	Kinetic current density (mA cm^{-2})	Reference
PCNNS-Phen-NaCl-H ₂ SO ₄	450	1.01	0.87	43.69 at 0.8 V	This work
FeTPP/C-800	100	0.95	0.837	10.3 at 0.8 V	1
Fe-N-C-700	30	0.93	0.802	19.4 at 0.58 V	2
Fe-N-Graphene	400	1.01	0.801	-	3
N-doped Fe/Fe3C@C-RGO	700	0.95	0.86	30.25 at 0.7 V	4
PANI-4.5Fe-HT2(SBA-15)	610	0.95	0.82	7.4 at 0.82 V	5
FePhen@MOF-ArNH ₃	600	1.030	0.86	-	6
PCN-FeCo/C	200	1.000	0.85	-	7
Fe-N/C	800	0.98	0.88	-	8
Fe ₃ C@NCNF-900	150	0.98	0.80	15 at 0.4 V	9
Fe-N-CC	100	0.94	0.83	18.3 at 0.58 V	10
Fe _x N-OMC	80	0.99	0.85	1.98 at 0.9 V	11
Fe-N-C	500	0.991	0.837	-	12
S-FeNC	160	0.911	0.799	-	13
C-Fe-Z8-Ar	560	0.95	0.82	-	14
COP@K10-Fe-900	200	0.97	0.85		15
FeN2/NOMC-3	500	1.05	0.86	45.2 at 0.79 V	16
Fe30NC-Ar700-NH ₃ -45%	800	-	0.87	1.91 at 0.9 V	17

Table S2. Comparison of ORR electrocatalytic performances between PCNNS-Phen-NaCl-H₂SO₄ and those reported Fe-N-C catalysts in acid medium.

Catalyst	Catalyst loading ($\mu\text{g cm}^{-2}$)	Onset potential (V vs RHE)	Half wave potential (V vs RHE)	Kinetic current density (mA cm^{-2})	Reference
PCNNS-Phen-NaCl-H ₂ SO ₄	450	0.94	0.76	1.70 at 0.8 V	This work
FeTPP/C-800	100	0.80	0.667	0.008 at 0.8 V	1
Fe-N-C-700	30	0.89	-	-	2
Fe-N-graphene	400	0.91	0.73	-	3
FePhen@MOF-ArNH ₃	600	0.93	0.77	-	6
PCN-FeCo/C	200	0.90	0.76	-	7
Fe-N/C	800	0.92	0.79	-	8
Fe-N-CC	100	0.80	0.52	4.85 at 0.46 V	10
S-FeNC	160	0.825	0.710	-	13
Fe ₃ C/C-700	600	0.90	0.73	-	18
Fe-N-GC-900	600	0.87	0.74	-	19
FeNP-C	600	0.87	0.72	-	20
Fe3C/NG-800	800	0.90	0.77	-	21
PpPD-Fe-C	900	0.826	0.718	-	22
Fe-N-HCMS	250	0.80	-	4.6 at 0.6 V	23
FeNCS-1000	495	0.95	0.71	-	24

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