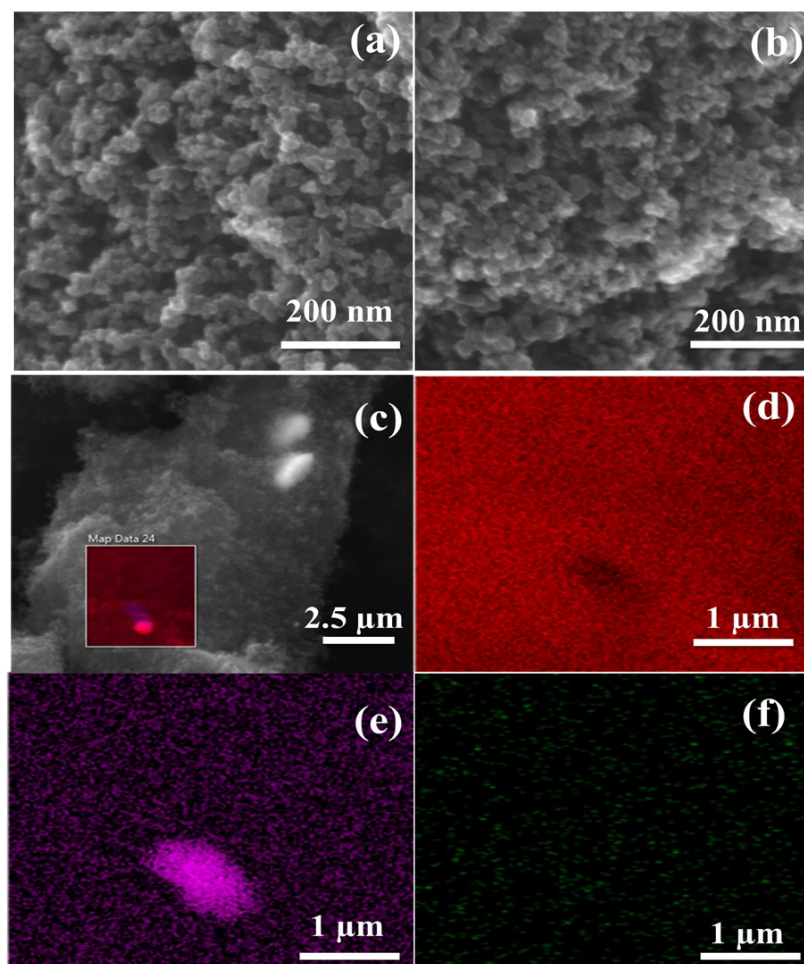# Supporting Information

NH$_3$-Plasma Pre-Treated Carbon Supported Active Iron-Nitrogen Catalyst for Oxygen Reduction in Acid and Alkaline Electrolyte
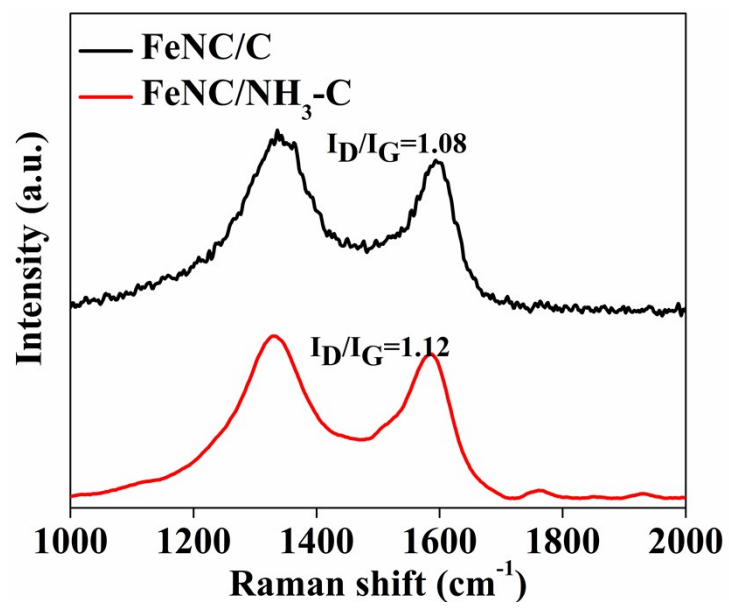
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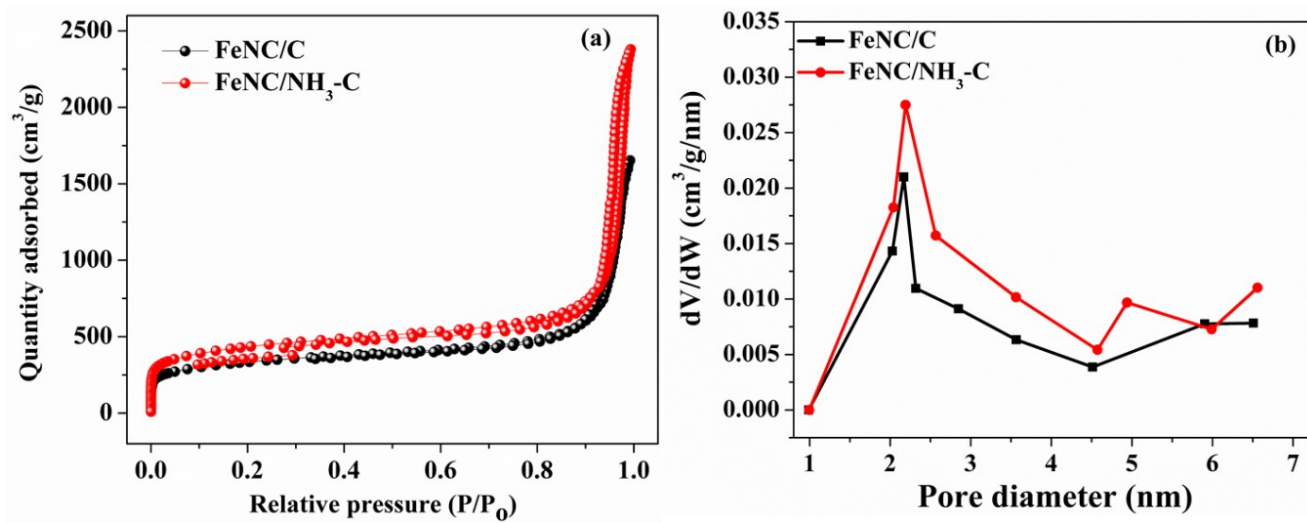
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Fig. S1 SEM image of FeNC/C (a), FeNC/NH$_3$-C (b), elemental mapping of FeNC/NH$_3$-C on the selected area in square (c), carbon (d), iron (e) and nitrogen (f) respectively

**Fig. S2** Raman spectra of FeNC/C and FeNC/NH$_3$-C.

Fig. S3 (a) Nitrogen adsorption and desorption isotherm; (b) Pore size distribution of FeNC/C and FeNC/NH$_3$-C

Table S1. XPS surface atomic ratio of FeNC/C and FeNC/NH$_3$-C

Catalyst	C (Atomic %)	N (Atomic %)	Fe (Atomic %)	O (Atomic %)	C/N ratio
FeNC/C	96.54	0.52	0.03	2.91	185.65
FeNC/NH$_3$-C	96.45	0.53	0.04	2.98	181.98

Table S2. ICP-AES and CHN/O elemental analysis of FeNC/C and FeNC/NH$_3$-C

Catalyst	Fe from ICP-AES (wt %)	CHN/O Elemental analysis			
		C (wt %)	N (wt %)	H (wt %)	O (wt %)
FeNC/C	0.14	96.51	1.21	0.08	2.06
FeNC/NH$_3$-C	0.22	96.27	1.30	0.09	2.12
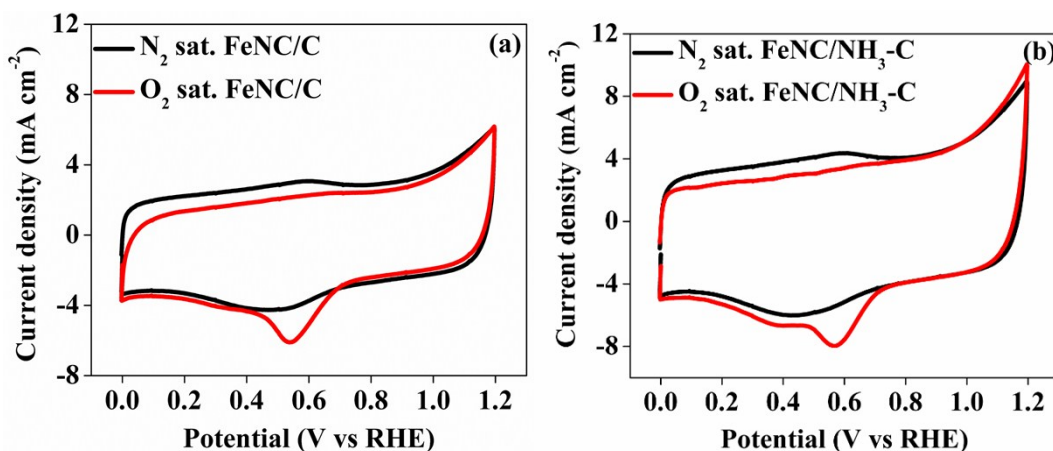
Fig. S4 Comparison of N$_2$ and O$_2$ saturated cyclic voltammogram in 0.5 M H$_2$SO$_4$ at a scan rate of 50 mV s^{-1} studied with (a) FeNC/C (b) FeNC/NH$_3$-C

Table S3. ORR activity of FeNC/C and FeNC/NH₃-C compared with 20% Pt/C in 0.5 M H₂SO₄

Catalyst	Onset potential (V vs RHE)	Half wave Potential (V vs RHE)	Limiting current density at 0.2 V vs RHE (mA cm⁻²)
FeNC /C	0.75	0.58	-5.3
FeNC/NH₃-C	0.80	0.63	-5.3
20% Pt/C	0.97	0.87	-5.5

Table S4. ORR activity of FeNC/C and FeNC/NH₃-C compared with 20% Pt/C in 0.1 M KOH

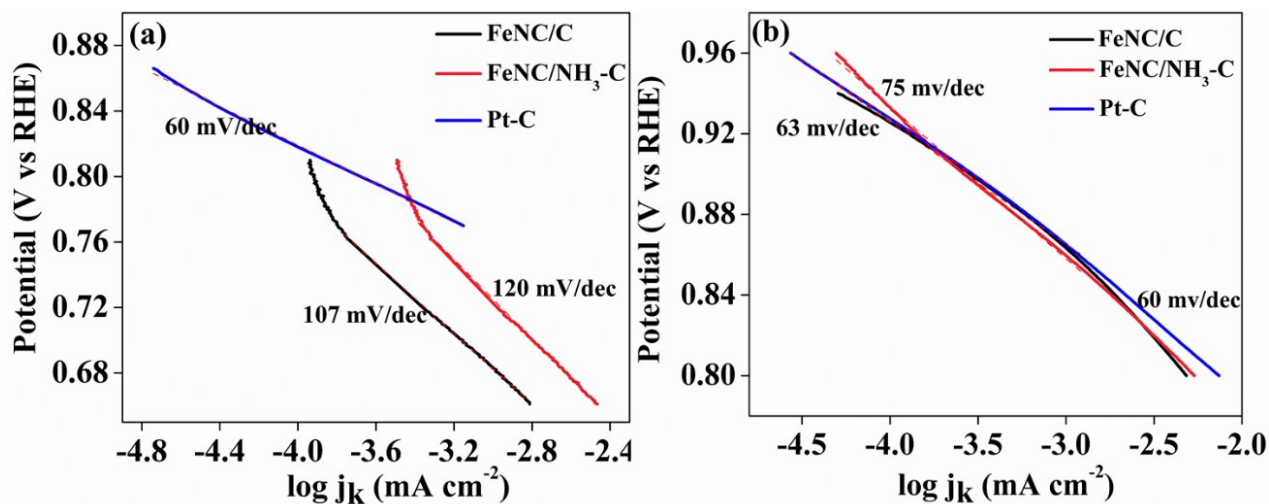| Catalyst	Onset potential (V vs RHE)	Half wave Potential (V vs RHE)	Limiting current density at 0.2 V vs RHE (mA cm⁻²)
FeNC/C	0.99	0.85	-5.74
FeNC/NH₃-C	1.0	0.86	-5.81
20% Pt-C	1.0	0.87	-5.16

Fig. S5 Tafel plot of FeNC/C, FeNC/NH$_3$-C and Pt-C in (a) 0.5 M H$_2$SO$_4$ and (b) 0.1 M KOH.
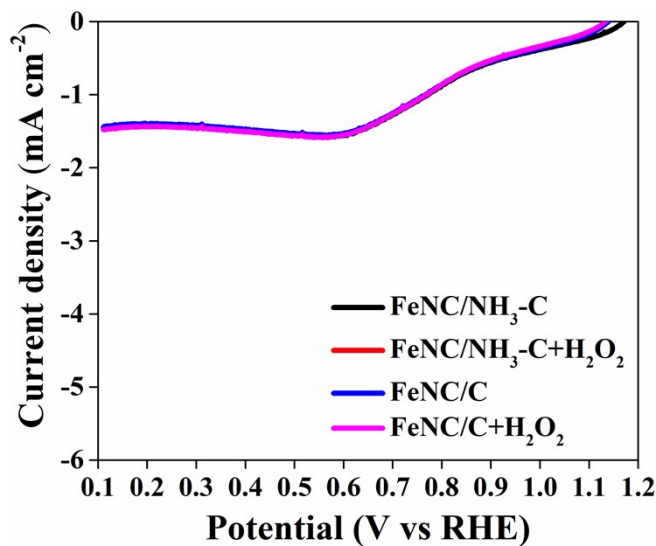

Fig. S6 LSV of FeNC/C and FeNC/NH$_3$-C in an electrolyte solution after adding 0.01 M peroxide in 0.5 M H$_2$SO$_4$ under N$_2$ with 5 mV s^{-1} scan rate

Table S5. A Comparative study of E_{onset}, $E_{1/2}$ towards ORR in acid and alkaline condition for several reported M-N-C catalysts

Catalyst	Onset potential	Half-wave potential vs RHE	Electrolyte	Reference
N-Fe/G (60) 900 s	0.834 V	0.716 V	0.1 M $HClO_4$	[1]
FeNC-900	0.85 V	0.72 V	0.1 M $HClO_4$	[2]
Fe-N-CNF	0.79 V	0.60 V	0.5 M H_2SO_4	[3]
Fe-N-C HNSs-750	0.78 V	0.54 V	0.5 M H_2SO_4	[4]
Fe-N/C 120	0.88 V	/	0.1 M $HClO_4$	[5]
Fe-CNT-PA	0.80 V	/	0.5 M H_2SO_4	[6]
FeNC/NH₃-C	**0.80 V**	**0.63 V**	**0.5 M H_2SO_4**	**This work**
Fe-N-CC	0.94	0.83	0.1 M KOH	[7]
N-Fe-C@CNTs	1.01	0.88	0.1 M KOH	[8]
C−Fe(OH)3@ ZIF-1000	0.99	0.88	0.1 M KOH	[9]
Fe/Fe2.5 C/Fe3N/N-CNT-30	0.93	0.79	0.1 M KOH	[10]
(MC-O2350-NH31050	0.978	0.871	0.1 M NaOH	[11]
N-Co_9S_8/G	0.941	0.76	0.1 M KOH	[12]
FeNC/NH₃-C	**1 V**	**0.86**	**0.1 M KOH**	**This work**

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