**Supporting information**

# Ionic Liquid as Precursor for Fe-N Doped Carbon Nanotubes Electrocatalysts for the Oxygen Reduction Reaction

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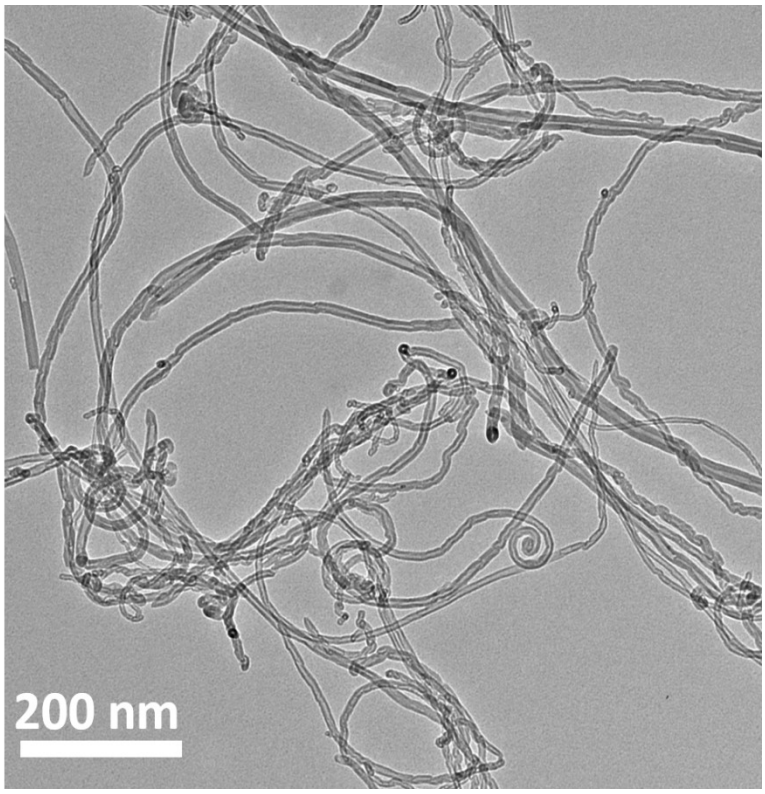


**Fig. S1.** TEM image of pristine CNT sample.

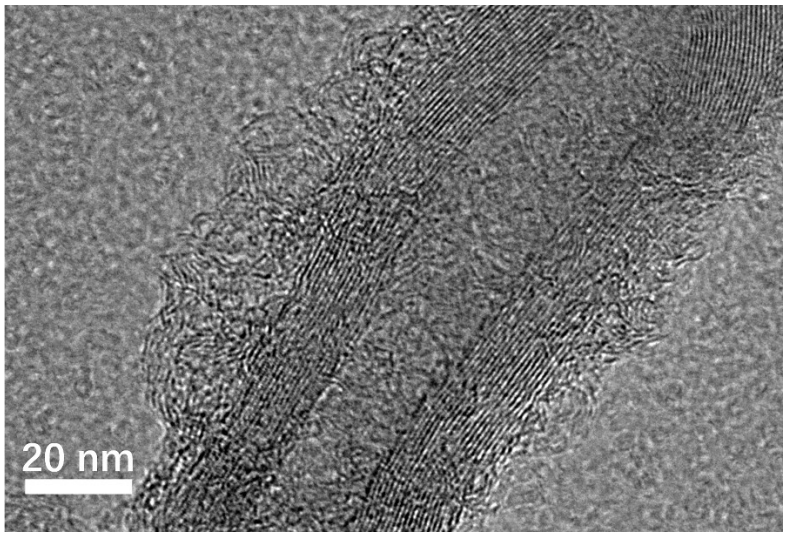


**Fig. S2.** HTEM image of CNT/Fe-N-C(3%).

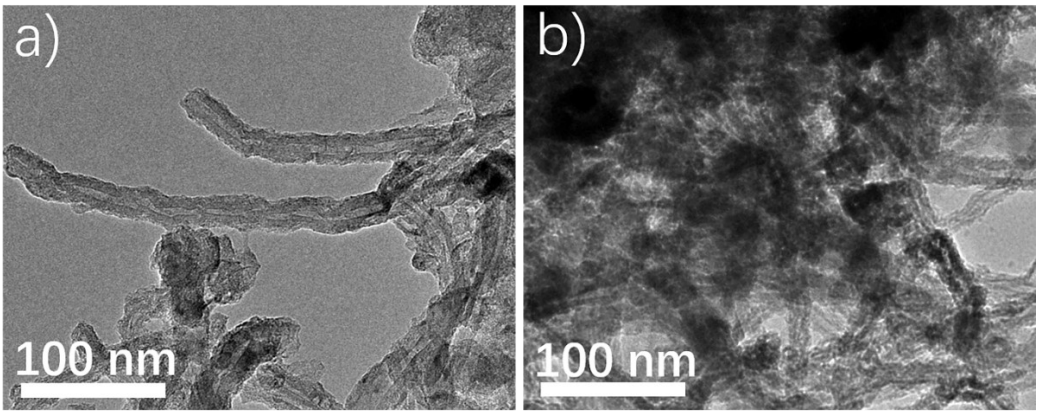


**Fig. S3.** TEM images of samples a) CNT/Fe-N-C(2%) and b) CNT/Fe-N-C(7%).

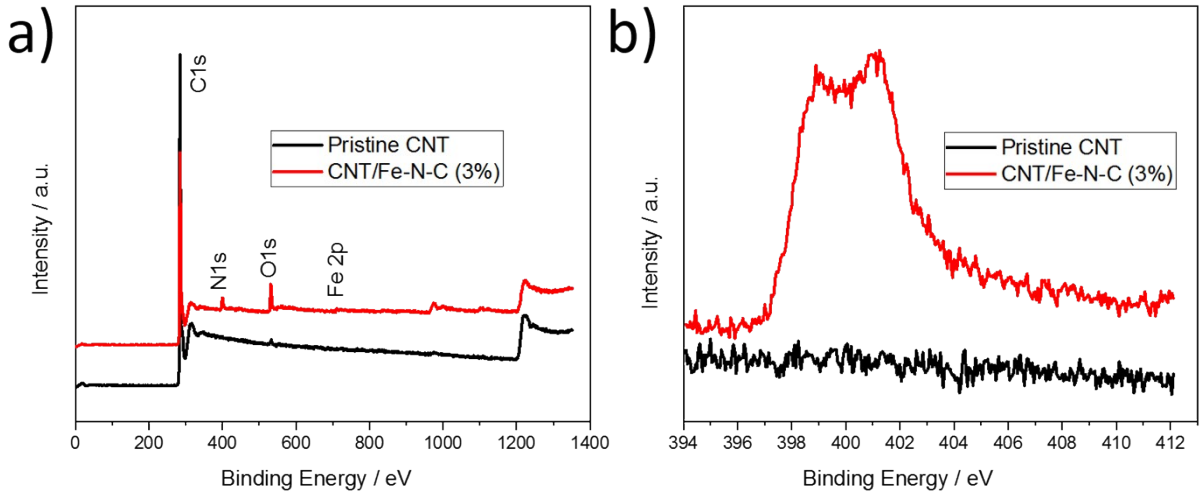


**Fig. S4.** X-ray photoelectron spectroscopy (XPS) analysis of pristine CNT and CNT/Fe-N-C catalysts (a) Full-scan XPS survey, (b) High resolution N 1s XPS spectra of pristine CNT and CNT/Fe-N-C with 3% Fe, respectively.

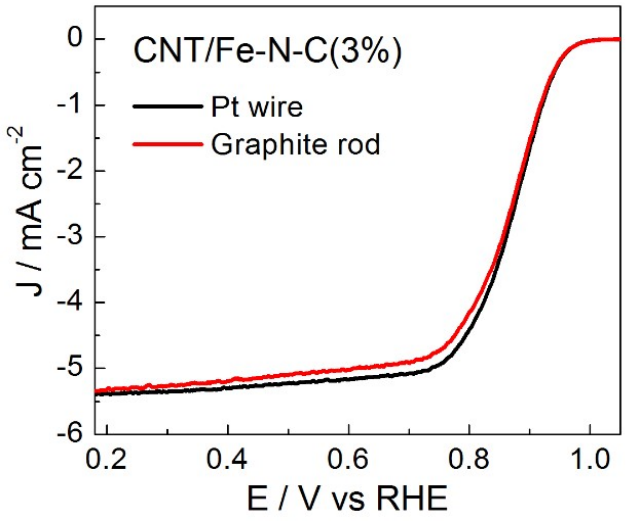


**Fig. S5.** Comparison of ORR catalytic performance of CNT/Fe-N-C(3%) in $O_2$-saturated 0.1 M KOH electrolyte using Pt wire and graphite rod as counter electrode.

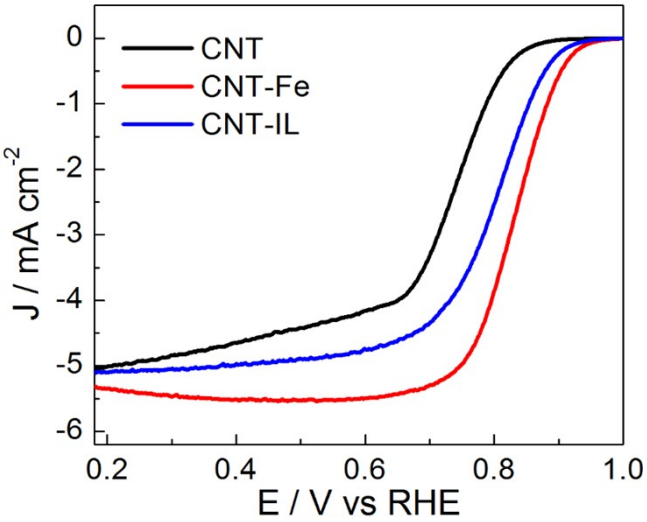


**Fig. S6.** ORR catalytic performance of CNT, CNT-Fe and CNT-IL in $O_2$-saturated 0.1 M KOH electrolyte.

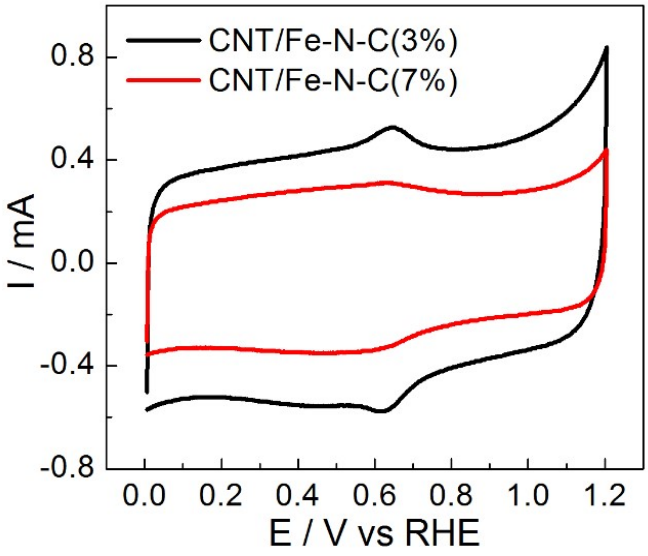


**Fig. S7.** Cyclic Voltammetry measurements of electroactive surface area (EASA) of the of CNT/Fe-N-C(3%) and CNT/Fe-N-C(7%) catalysts in $N_2$-saturated 0.5 M $H_2SO_4$ electrolyte.

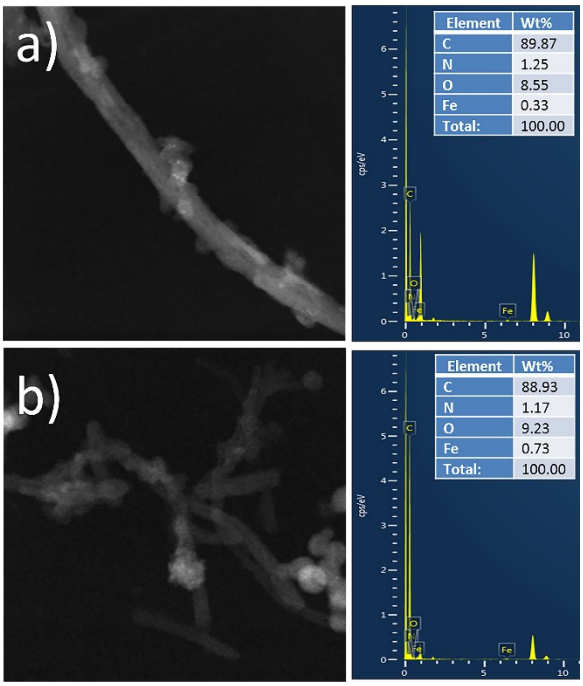


**Fig. S8.** A representative EDX spectrums of catalysts a) CNT/Fe-N-C(3%), b) CNT/Fe-N-C(7%).

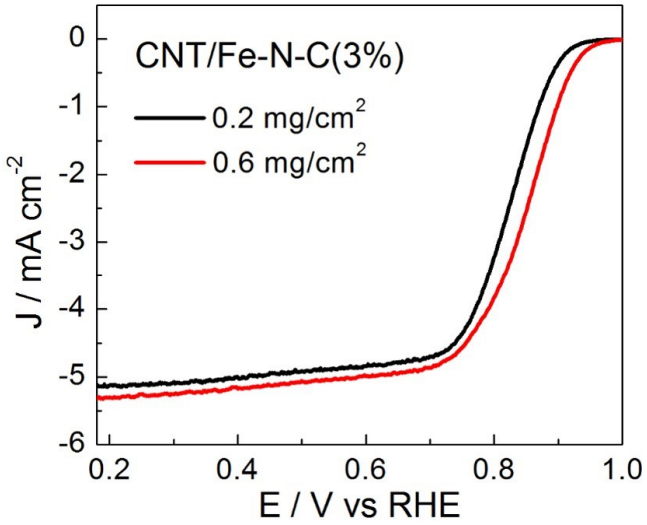


**Fig. S9.** Comparison of ORR polarization curves obtained at catalyst loadings of 0.2 and 0.6 mg $cm^{-2}$ in $O_2$ saturated 0.1 M KOH at 1600 rpm.

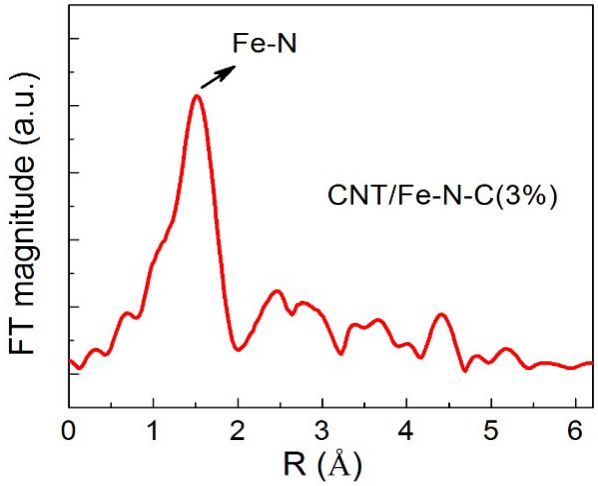


**Fig. S10.** Fourier transform of the Fe K-edge EXAFS spectra of CNT/Fe-N-C(3%) catalyst.

**Table S1.** The composition of Fe content in different CNT/Fe-N-C catalysts determined by ICP-AES before and after the ORR.

| Sample | ICP Fe (wt%) | |
|---|---|---|
| | Before | After |
| CNT/Fe-N-C(3%) | 3.01% | 2.92% |
| CNT/Fe-N-C(7%) | 6.95% | 6.87% |

**Table S2.** Comparison of the $E_{onset}$ and $E_{1/2}$ toward ORR for non-noble metal catalysts in 0.1 M KOH reported in this work and some representative literature.

| Sample | $E_0$ (V) | $E_{1/2}$ (V) | Loading (mg cm$^{-2}$) | Source |
|---|---|---|---|---|
| CNT | 0.88 | 0.74 | 0.60 | This study |
| CNT/Fe | 0.96 | 0.83 | 0.60 | This study |
| CNT/IL | 0.94 | 0.80 | 0.60 | This study |
| CNT/Fe-N-C(3%) | 1.00 | 0.88 | 0.60 | This study |
| CNT/Fe-N-C(7%) | 0.99 | 0.86 | 0.60 | This study |
| Pt/C (20wt% Pt) | 0.99 | 0.83 | 0.10 | This study |
| P12-900 | 1.01 | 0.86 | 0.50 | Ref. 1 |
| NOSC8-900 | 0.96 | 0.74 | 0.20 | Ref. 2 |
| FeNCNH-900 | 1.00 | 0.87 | 0.50 | Ref. 3 |
| Fe-N/C-800 | 0.92 | 0.81 | 0.10 | Ref. 4 |
| C-Fe(OH)$_3$@ZIF-1000 | 0.99 | 0.88 | 0.60 | Ref. 5 |
| FeN$_x$-PNC | 1.00 | 0.86 | 0.14 | Ref. 6 |
| Fe/SNC | 0.97 | 0.85 | 0.60 | Ref. 7 |

## References


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