Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Triple Phase Boundary Augmentation in Hierarchical, Pt grafted N-doped Mesoporous Carbon Nanofibers for High Performance and Durable PEM Fuel Cells

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Electronic Supplementary Information

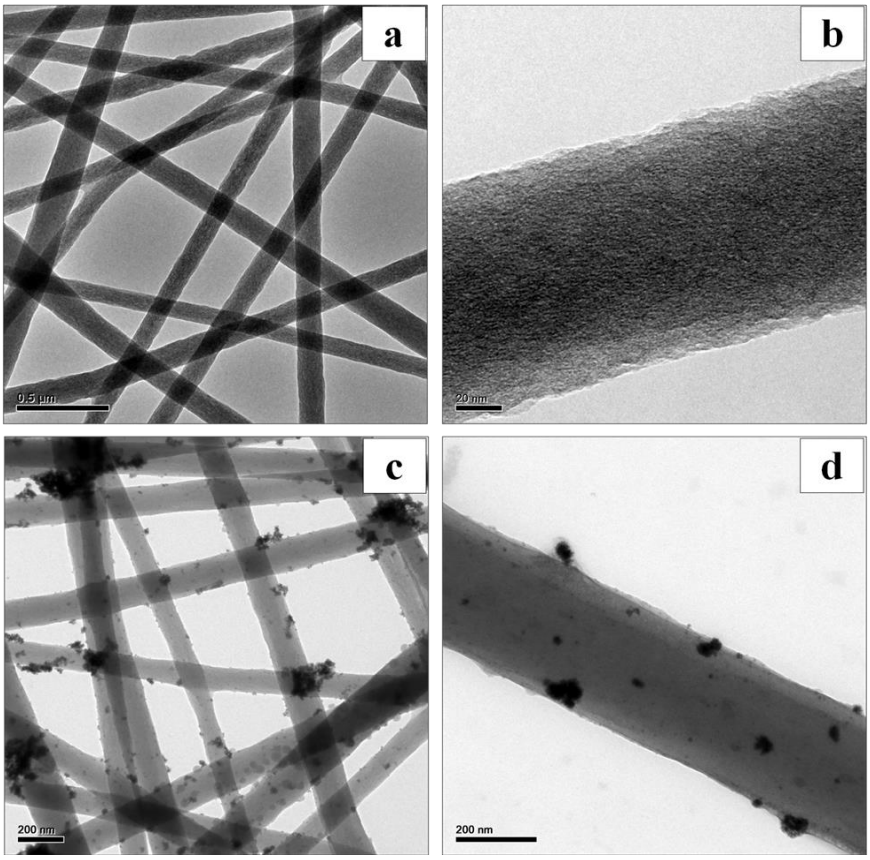

Figure S1. High Resolution Transmission Electron Microscope images of (a-b) CNFs and (c-d) Pt/CNFs.

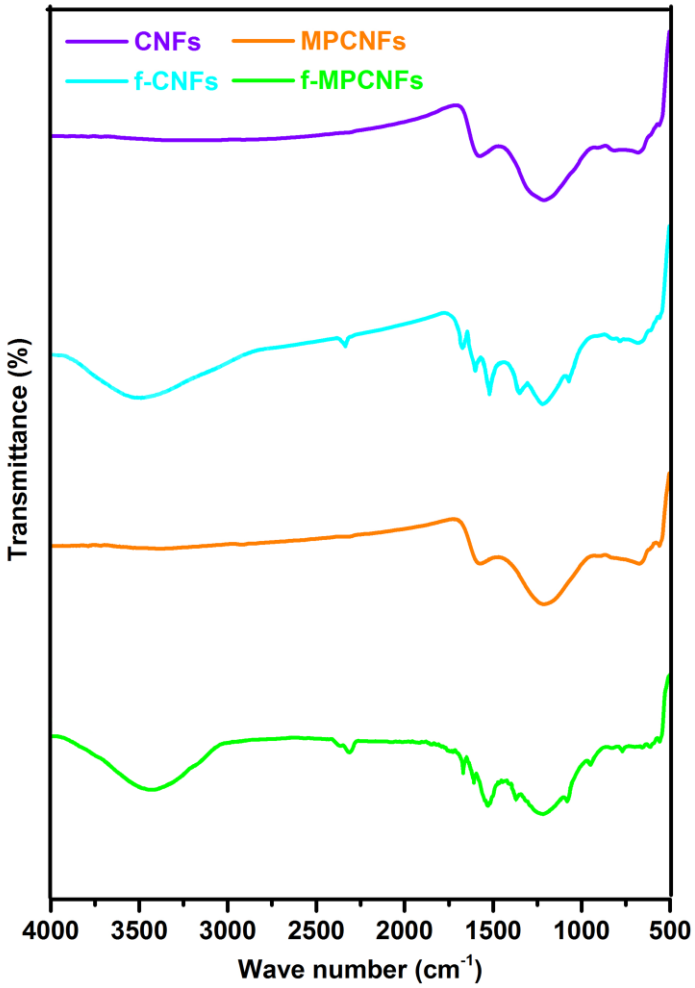

Figure S2. ATR-FITR spectra of as-synthesized and functionalized CNFs and MPCNFs.

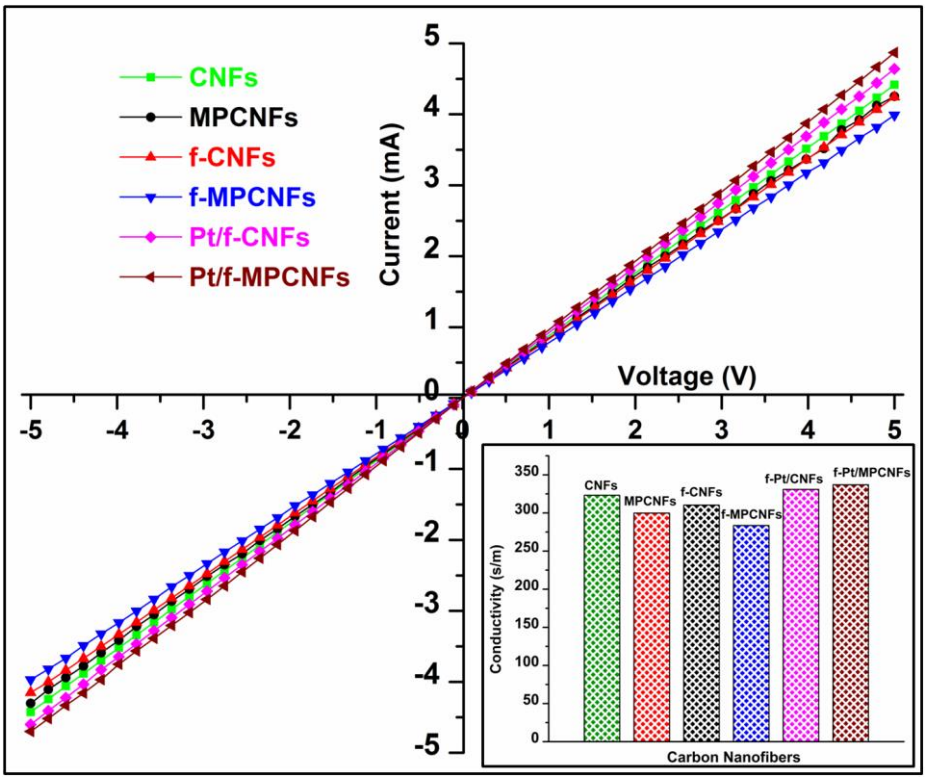

Figure S3. I-V characteristics of carbonized, functionalized and Pt incorporated nanofibers.

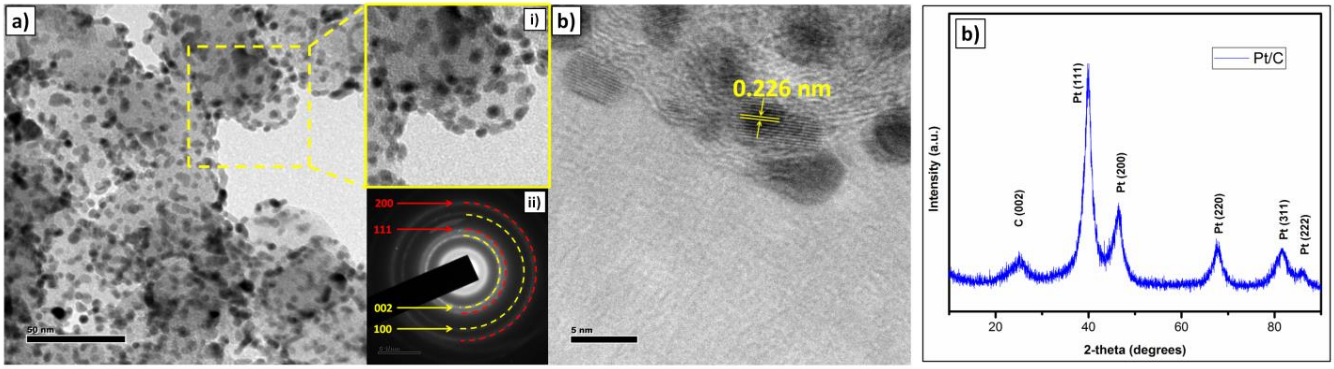

Figure S4. (a) TEM micrograph of commercial Pt/C (inset: (i) high magnification and (ii) selected area diffraction pattern), (b) high resolution TEM image and (c) XRD patterns of Pt/C.

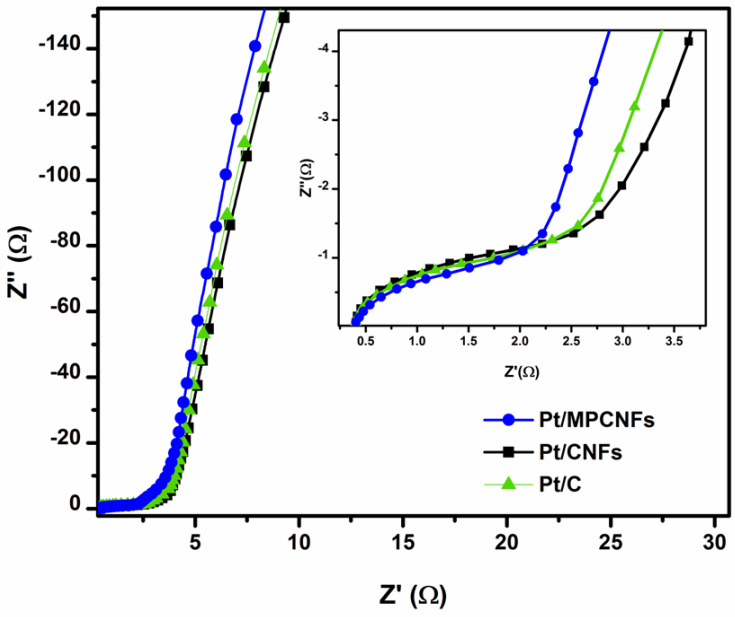

Figure S5. Complex–plane impedance (Nyquist) plots of Pt/MPCNFs, Pt/CNFs and Pt/C electrocatalysts. The inset shows the high-frequency region of impedance.

Table S1. Comparison of the ORR results with the reported Pt/C electrocatalysts.

Electrocatalyst	Onset potential (mV)	Limited current density mA/cm^2 (at 0.4 V)	Half wave potential (mV)	References
Pt/MPCNFs	993	4.75	911	Present work
Pt/CNFs	978	4.47	883	Present work
Pt/C	934	4.04	834	Present work
Other reported Pt/C catalysts	913	-	770	[1]
	847	4.31	714	[2]
	-	-	749	[3]
	700	3.98	-	[4]
	710	2.86	-	[5]
	915	3.30	-	[6]
	921	-	850	[7]
	897	3.72	706	[8]
	910	-	810	[9]

References:

1 N. Wu, Y. Wang, Y. Lei, B. Wang, C. Han, Y. Gou and Q. Shi, Nat. Publ. Gr., 2015, 1–9.

2 Y. Wang, J. Jin, S. Yang, G. Li and J. Qiao, Electrochim. Acta, 2015, 177, 181–189.
3 H. Lv, N. Cheng, T. Peng, M. Pan and S. Mu, J. Mater. Chem., 2012, 22, 1135–1141.
4 J. Yin, Y. Qiu and J. Yu, J. Electroanal. Chem., 2013, 702, 56–59.
5 J. Yin, Y. Qiu and J. Yu, Electrochem. commun., 2013, 30, 1–4.
6 C. V. Rao and B. Viswanathan, J. Phys. Chem. C, 2009, 113, 18907–18913.
7 Q. Li, P. Xu, B. Zhang, G. Wu and H. Zhao, Nanoscale, 2013, 1–6.
8 K. Mohanraju, G. Kousik and L. Cindrella, New J. Chem., 2016, 40, 8681–8695.
9 H. Jin, H. Zhang and J. Zhang, E. Environ. Sci., 2011, 3389–3394.