Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supporting Information

Hexanedioic Acid Mediated in-situ Functionalized Interconnected Graphitic 3D Carbon Nanofibers as Pt Support Catalysts for Trifunctional Electrocatalysis

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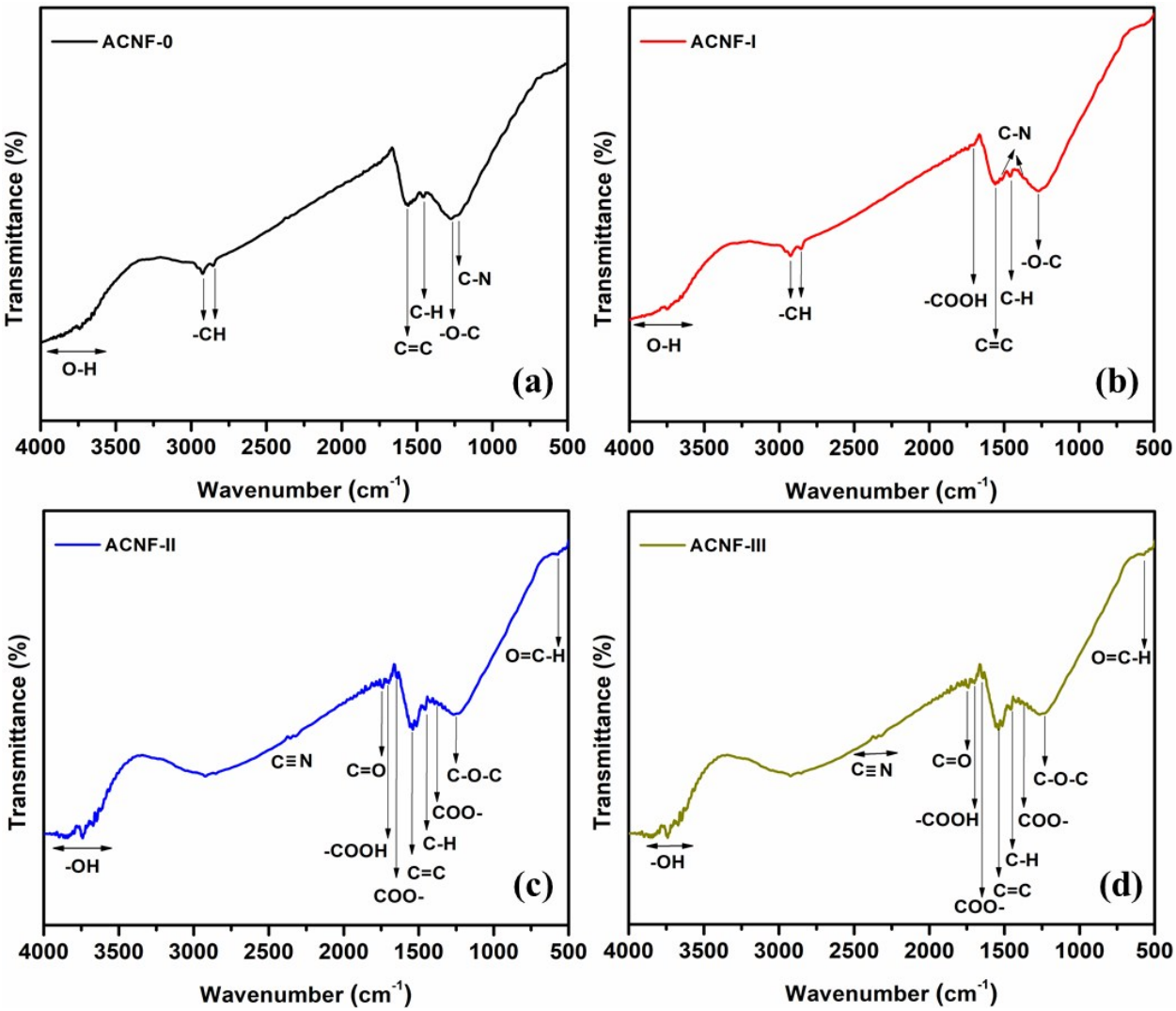

Fig. S1 FTIR spectra of ACNF-0 (a), ACNF-I (b), ACNF-II (c), and ACNF-III (d).

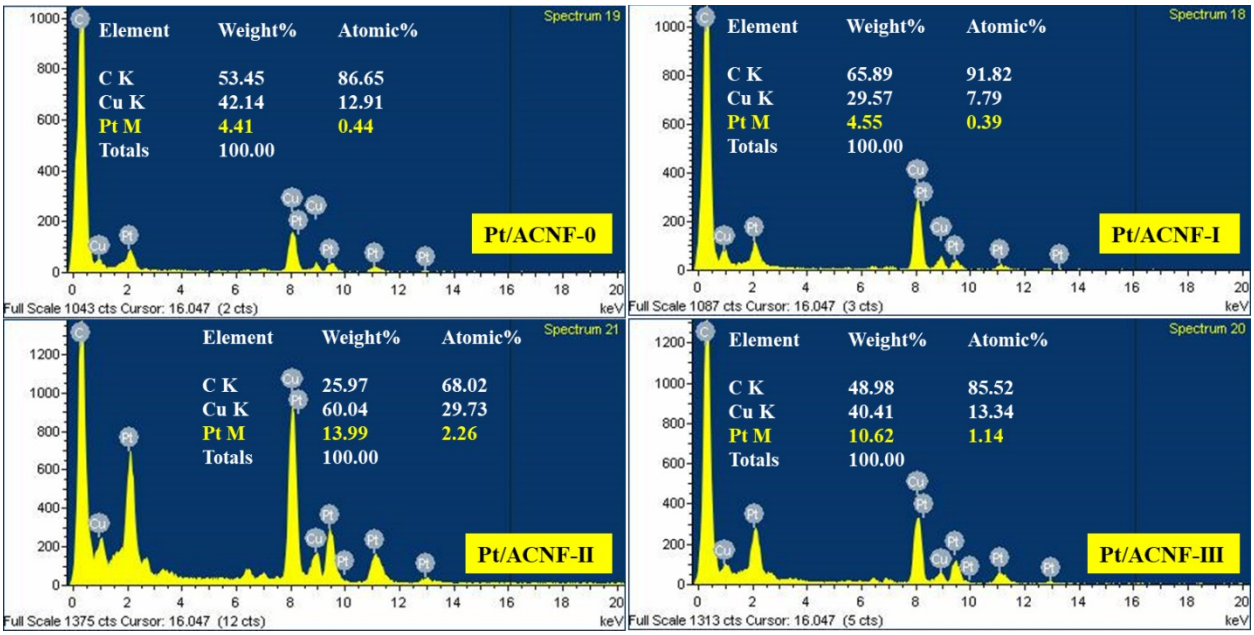

Fig. S2 EDAX spectra of Pt/ACNFs.

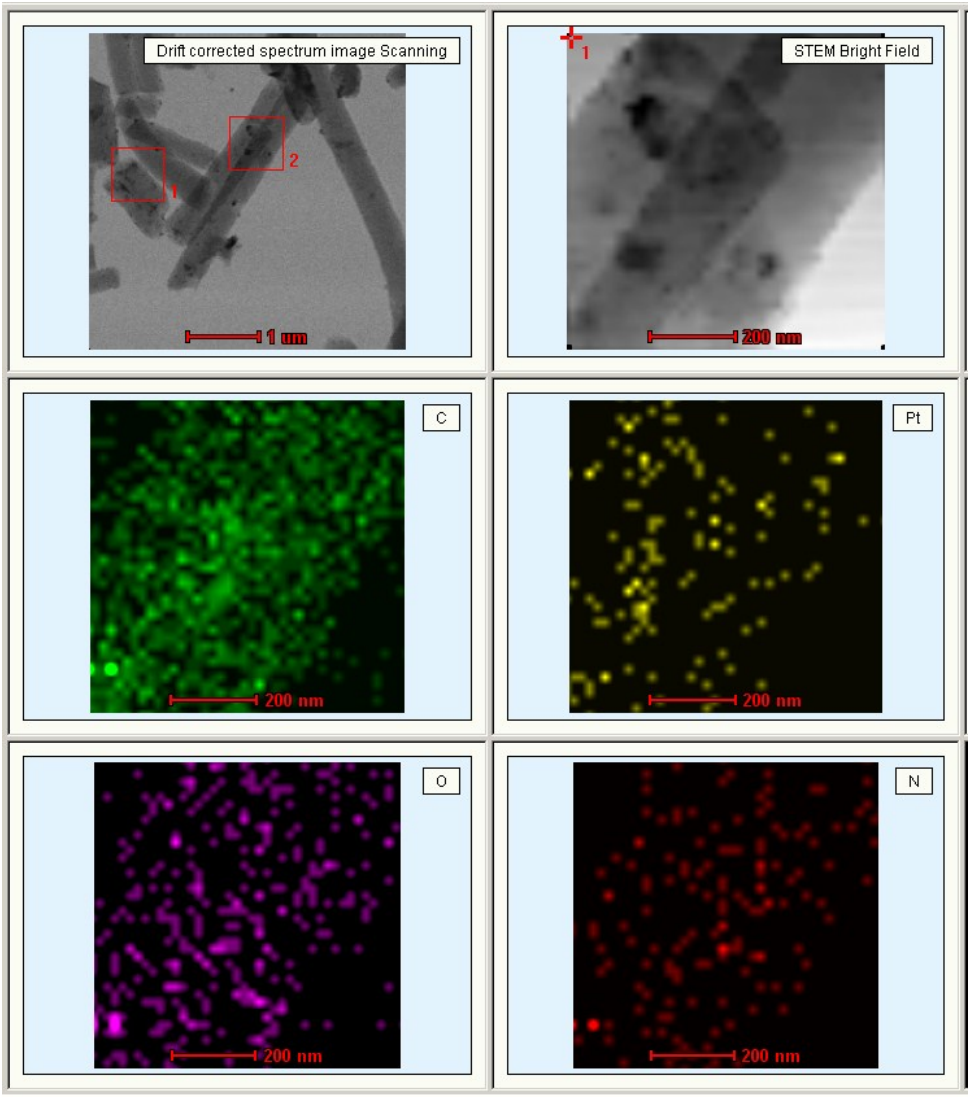

Fig. S3 Elemental mapping images of Pt/ACNF-II.

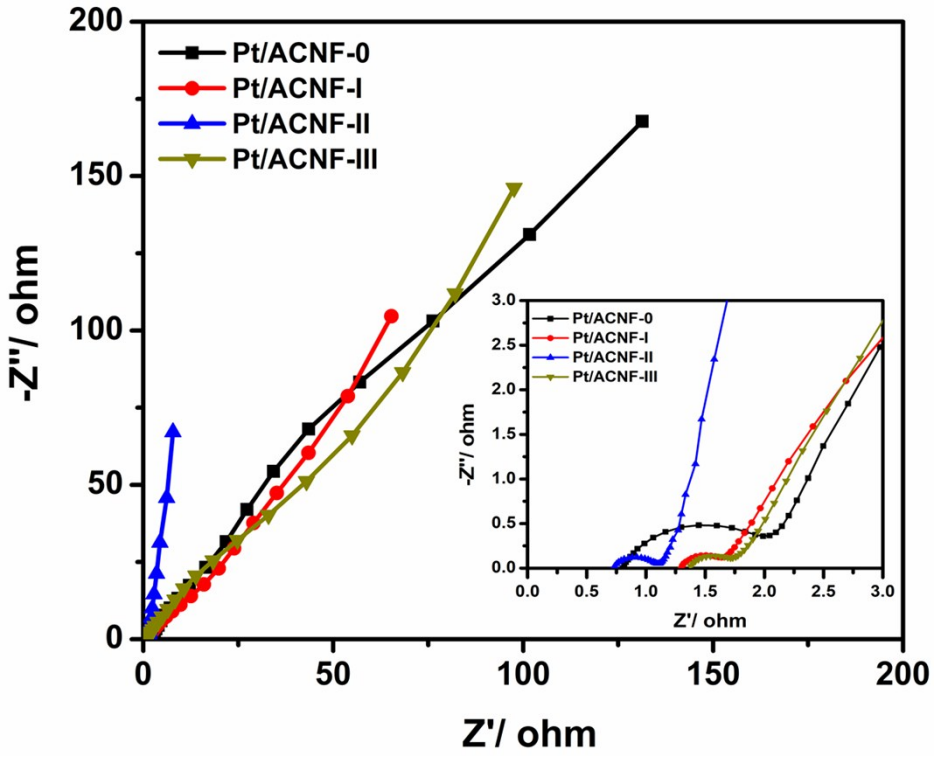

Fig. S4 EIS analysis: Nyquist plot of prepared Pt/ACNF electrodes.

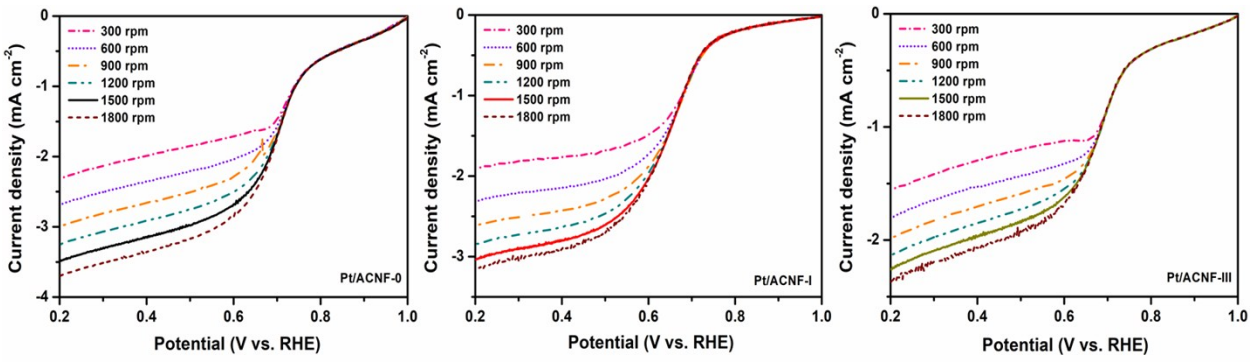

Fig. S5 LSV polarization curves of Pt/ACNF-0, I, and II at various rpms.

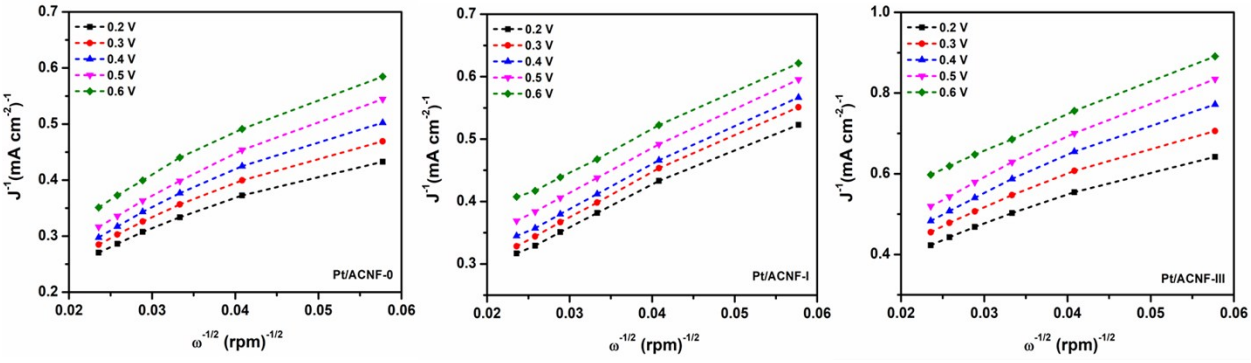

Fig. S6 K-L plots of Pt/ACNF-0, I, and II.

Table S1. Structural parameters from XRD and Raman analysis.

ACNFs	XRD									RAMAN
	(0 0 2)				(1 0 0)				R	I_D/I_G
	2 θ (deg)	d_{002} (nm)	FWHM (2 θ)	L_c (nm)	2 θ (deg)	d_{100} (nm)	FWHM (2 θ)	L_a (nm)		
ACNF-0	24.76	0.359	8.637	0.95	43.70	0.206	5.215	3.35	3.71	0.90
ACNF-I	24.87	0.357	8.562	0.96	43.90	0.206	5.198	3.36	3.72	0.89
ACNF-II	25.07	0.354	8.371	0.98	44.10	0.205	4.826	3.63	3.92	0.88
ACNF-III	24.68	0.360	8.655	0.94	43.61	0.207	5.353	3.27	3.55	0.92

Table S2. Elemental composition of prepared ACNFs obtained using XPS analysis.

ACNFs	C1s (At. %)	N1s (At. %)	O1s (At. %)	N/C	O/C
ACNF-0	85.5	9.1	5.4	0.10	0.06
ACNF-I	84.8	9.6	5.6	0.11	0.07
ACNF-II	81.9	11.2	6.9	0.14	0.09
ACNF-III	81.7	9.7	8.6	0.12	0.11

Table S3. Comparative performance of ORR with other related recent reports on Pt based electrocatalysts.

Electrocatalysts	**Electrolyte (H_2SO_4)**	**Onset Potential (mV)**	**Half-Wave Potential (mV)**	**Tafel Slope (mV dec^{-1})**	**Ref**
Fe@Pt/C	0.5 M	-	-	119	[S1]
2Pt-35TiO_2/MWCNT	0.05 M	0.92	0.75	62 133	[S2]
Pt/MWCNT-RT	0.05 M	-	0.82	62 119	[S3]
Pt/MWCNT-B1500	0.05 M	-	0.88	68 118	[S4]
Pt/rGO-N	0.05 M	-	0.85	63 121	[S5]
PtCo/10PAN–CNT	0.5 M	-	-	59.5	[S6]
Pt/*m*PHCNFs	0.5 M	0.998	0.917	-	[S7]
TiH_2S60	0.5 M	0.8	-	93	[S8]
Pt/S-MC	0.5 M	-	0.886	84	[S9]
Pt/CFx	0.5 M	-	-	109	[S10]
Pt/Ni_3P/CNT-CNF	0.5 M	0.729	0.499	-	[S11]
Pt/CNF 700	0.5 M	-	-	65 120	[S12]
Pt-C (Mo_2C) 800 C	0.5 M	0.98	0.83	125	[S13]
Pt/ACN3F-II	**0.5 M**	**0.90**	**0.79**	**69** **129**	**Present work**

Table S4. Comparative performance of MOR with other related recent reports on Pt based electrocatalysts.

Electrocatalysts	**Electrolyte (0.5M H_2SO_4 +)**	**Scan rate ($mV\ s^{-1}$)**	**ECSA ($m^2\ g^{-1}$)**	**Mass Activity ($A\ g^{-1}$)**	**Ref**
Pt/C-OT-30	1M CH_3OH	50	72.150	-	[S14]
Pt/MWCNTs-U	1M CH_3OH	50	36.0	-	[S15]
Pt/Co-coal-CF	0.5M CH_3OH	50	-	78.5	[S16]
Pt/CXG-3s	2M CH_3OH	20	59	-	[S17]
Pt/Lg-CDs-800	0.5M CH_3OH	50	40.6	-	[S18]
Pt (10cycles)-CQD	0.5M CH_3OH	50	49.61	-	[S19]
PtPd SAANs	0.5M CH_3OH	50	-	376.0	[S20]
PtAu PNCs	0.5M CH_3OH	50	-	85.2	[S21]
PtNPs/TPANI-MWCNTs	0.5M CH_3OH	50	42.53	173	[S22]
Pt/ATO NF	0.5M CH_3OH	50	33	102	[S23]
Pt/PVA-CuO-Co_3O_4/CH	1.83M CH_3OH	100	54.56	-	[S24]
PtCu NFs	0.5M CH_3OH	50	63.7	1.64 ($A\ mg^{-1}$)	[S25]
PtRu/GS-CNTs	1M CH_3OH	20	118.69	-	[S26]
Pt/3D-SPG	0.5M CH_3OH	50	79.65	-	[S27]
Pt/$Ti_{0.9}Cu_{0.1}N$	0.5M CH_3OH	50	57.5	1.56 ($A\ mg^{-1}$)	[S28]
Pt/ACNF-II	**1M CH_3OH**	**20**	**119.21**	**684.57**	**Present work**

Table S5. Comparative performance of HER with other related recent reports on Pt based electrocatalysts.

Electrocatalysts	**Electrolyte**	**Overpotential, η_{10}(mV)**	**Tafel Slope (mV dec^{-1})**	**Ref**
PtNi/CNFs	0.5 M H_2SO_4	34	31	[S29]
PtPd NSs	0.5 M H_2SO_4	22	37	[S30]
$Pt_{66}Ni_{34}$ NFs	0.5 M H_2SO_4	43	33	[S31]
Pt-12	0.5 M H_2SO_4	50(η_{60})	31	[S32]
Pt NPs/rGO	0.5 M H_2SO_4	42	36	[S33]
PtCu RDNFs	0.5 M H_2SO_4	40	35.51	[S34]
Pt NPs/CNFs	0.5 M H_2SO_4	175	50	[S35]
$Pt_{13}Cu_{73}Ni_{14}$/CNF@CF	1M H_2SO_4	70	38	[S36]
Pt/HPC-14.1	0.5 M H_2SO_4	24	33	[S37]
$PtNi_2$@CNS-600	0.5 M H_2SO_4	68	35.27	[S38]
$Pt_{75}Co_{25}$ NDAs	0.5 M H_2SO_4	34	30	[S39]
H-AgPt NCs	0.5 M H_2SO_4	51	40	[S40]
Pt@HN-BC	0.5 M H_2SO_4	47	35	[S41]
Pt/BCF	0.5 M H_2SO_4	55	32	[S42]
AC Pt-NG/C	0.5 M H_2SO_4	35.28	27	[S43]
Pt/rGO/GCE	0.5 M H_2SO_4	-	33	[S44]
Pt/ACNF-II	**0.5 M H_2SO_4**	**50**	**35**	**Present work**

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