Supplementary Information

Facile Fabrication of N-Doped Hierarchical Porous Carbon@CNTsCoaxial Nanocable with High Performance for Energy Storage and Conversion

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1. **Figures**

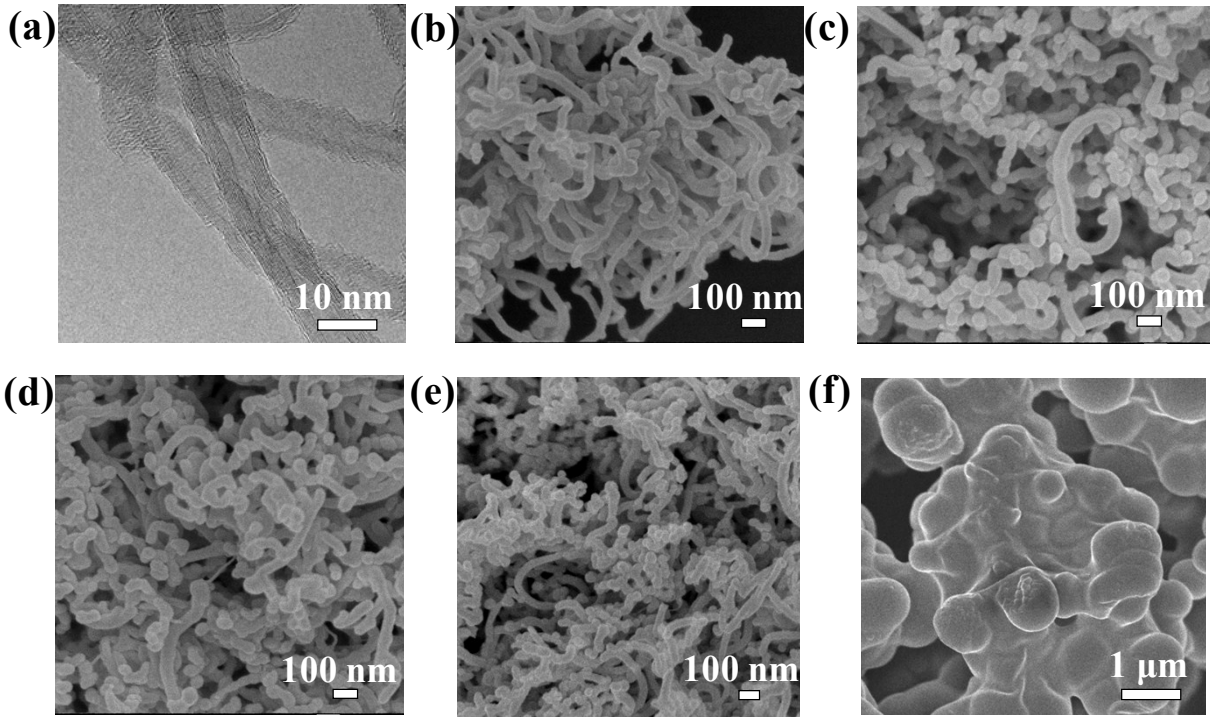

Figure S1 TEM image of (a) CNTs. SEM image of (b) HPNCNTs, (c) S-600, (d) S-700, (e) S-900, (f) NCs.

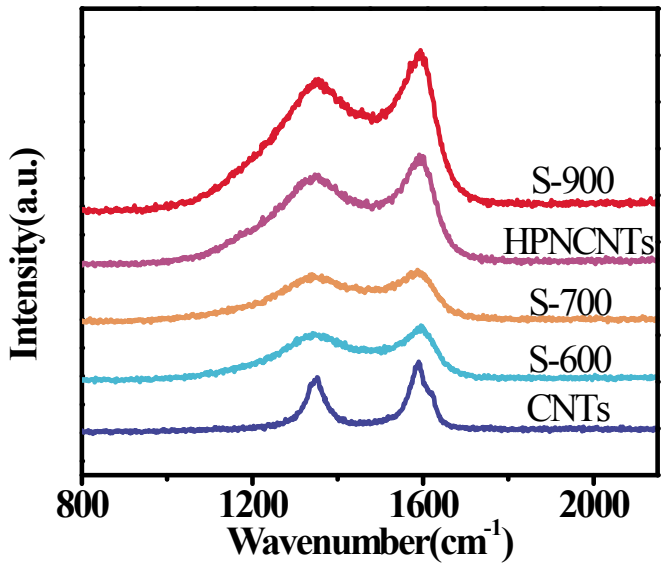

Figure S2 Raman spectra of pristine CNTs, HPNCNTs, S-600, S-700 and S-900.

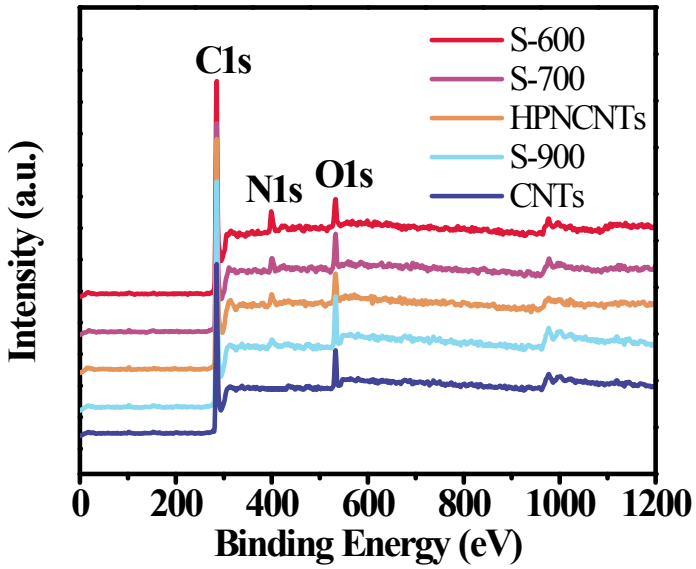

Figure S3 XPS survey spectra of CNTs and HPNCNTs, S-600, S-700 and S-900.

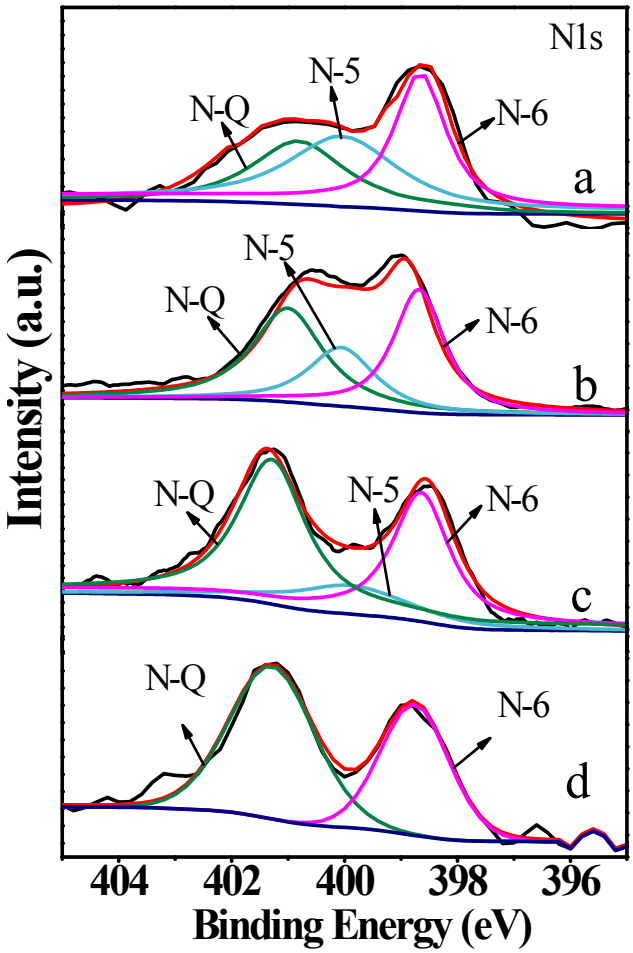

Figure S4 N1s XPS spectra of (a) S-600 , (b) S-700 , (c) HPNCNTs and (d) S-900 .

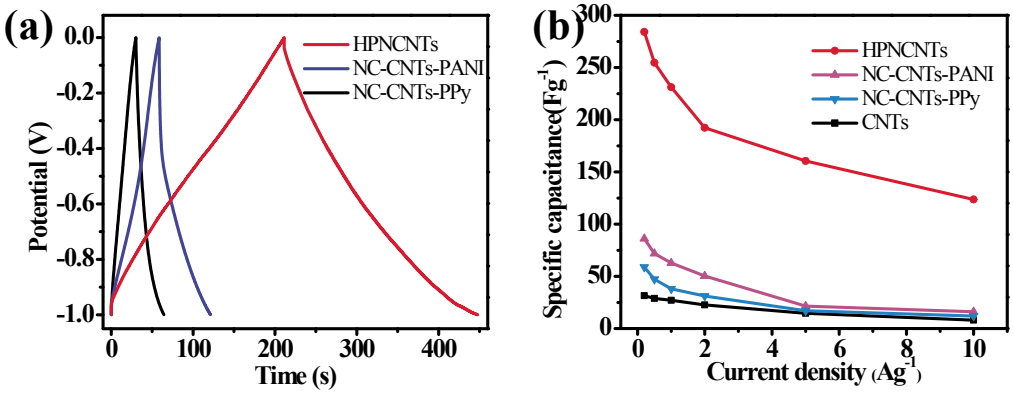

Figure S5 (a) Galvanostatic charge/discharge curves at 1 Ag^{-1}. (b) Specific capacitances of HPNCNTs, NC-CNTs-PANI, NC-CNTs-PPy and CNTs electrodes at different current densities.

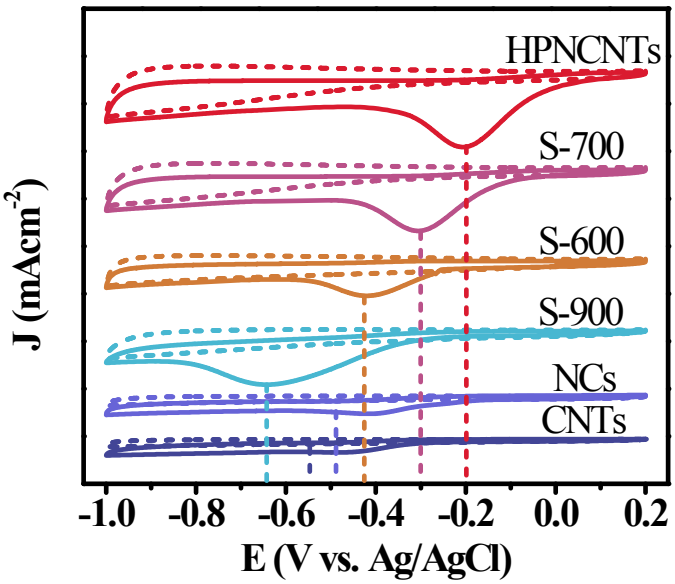

Figure S6 CV curves in N_2-saturated (dashed curves) and O_2-saturated (solid curves) solution with a sweep rate of 50 mV s^{-1}.

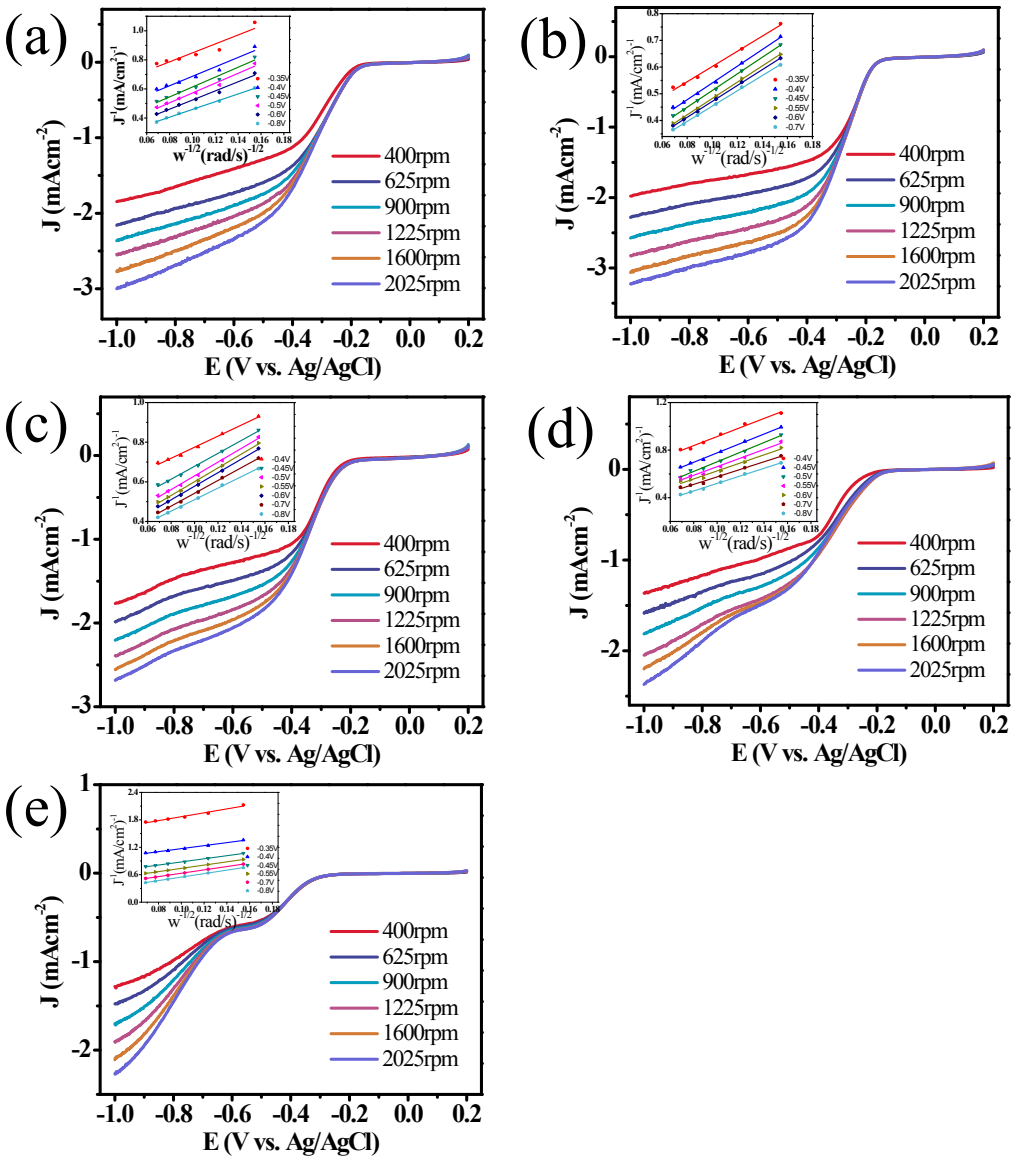

Figure S7 RDE polarization curves for (a) S-600, (b) S-700, (c) S-900, (d) NCs and (e) CNTs in O_2-saturated solution at different rotation speeds. Scan rate: 10 mV s^{-1}. The inset shows the partial K-L plots derived from the RDE measurements of the sample.

2. Tables

Table S1 Element content of HPNCNTs calcined at different temperatures.

Sample	C (at %)	N (at %)	O (at %)
Microporous RMF@CNTs	71.32	19.16	9.52
S-600	88.35	6.81	4.84
S-700	89.58	4.24	6.18
HPNCNTs	92.49	3.17	4.34
S-900	93.51	2.05	4.44

Table S2 Surface and pore related parameters from N_2 adsorption isotherms of samples.

Sample	BET surface area (m^2g^{-1})	Total pore volume (cm^3g^{-1})	Micropore volume (cm^3g^{-1})	Pore size (nm)
CNTs	99.4	0.209	0.097	2.4
RMF@CNTs	228.6	0.223	0.193	2.1/4.0/15.8
HPNCNTs	663	0.393	0.268	1.9/2.8/13/22/51.7

Table S3 Comparison of BET specific surface area and pore volume for different carbon-based material.

Sample	BET specific surface area (m^2g^{-1})	Pore distribution (nm)	Pore Volume (cm^3g^{-1})	Ref.
CNT/PANI	75	2	--	[1]
Polyaniline derived N doped carbon	388	--	0.071	[2]
HPNCNTS-0.5 derived from PANI	252	---	---	[3]
N-doped CNT derived from urea	388	3.5/8.0	0.55	[4]
N-doped porous carbon nanofibers	384.12	5.07	0.44	[5]
MF-CNT derived from melamine	403	----	0.174	[6]
N-doped carbon/CNT derived from PANI	197.01	0.5/0.7/1.3	0.163	[7]
HPNCNTs	663	1.9/2.8/13/22/51.7	0.293	This work

Table S4 Comparison of capacitance data reported for different carbon-based materials.

Samples	Electrolyte	Scan Rate	Specific capacitance (F g^{-1})	Ref.
N-doped porous carbon nanofibers	6 M KOH	0.5 Ag^{-1}	202	5
NCNT derived from melamine	1M H_2SO_4	1 mVs^{-1}	167	6
N-doped carbon/CNT derived from PANI	6 M KOH	20mVs^{-1}	205	7
CNTs/N-enriched carbon	1M H_2SO_4	--	100	8
N-enriched carbon from melamine mica	6 M KOH	0.05Ag^{-1}	198	9
N/C-MWNTs derived from melamine	1M H_2SO_4	0.5 Ag^{-1}	262	10
Nitrogen-doped hierarchical porous carbon	6 M KOH	0.2 Ag^{-1}	260.3	11
CNT/carbon Core-shell nanocomposites	3 M H_2SO_4	0.1 Ag^{-1}	237	12
HPNCNTs	6 M KOH	0.2 Ag^{-1}	284	This work

References

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