Electronic Supplementary Material (ESI) for Nanoscale Advances.

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A high-energy sodium-ion capacitor enabled by nitrogen/sulfur co-doped hollow carbon nanofiber anode and activated carbon cathode

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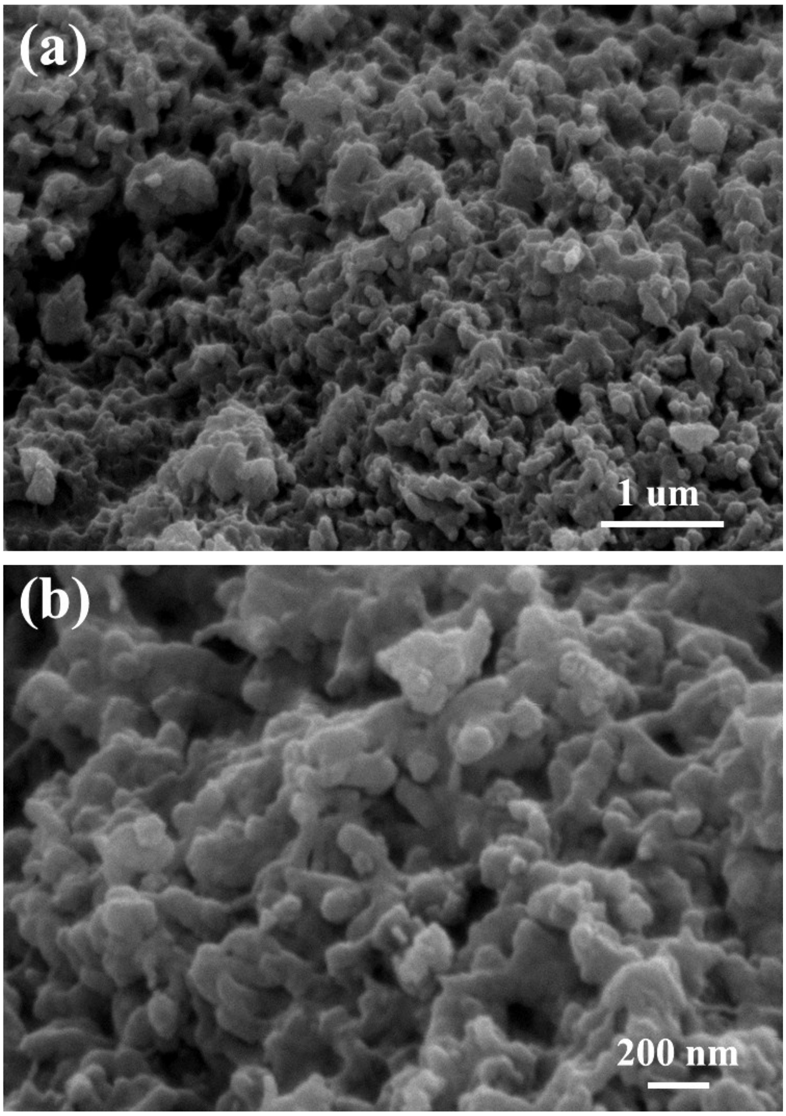

Fig. S1 SEM images (a, b) of the bulk polyaniline particle aggregates, which were prepared by direct polymerization of aniline without any template.

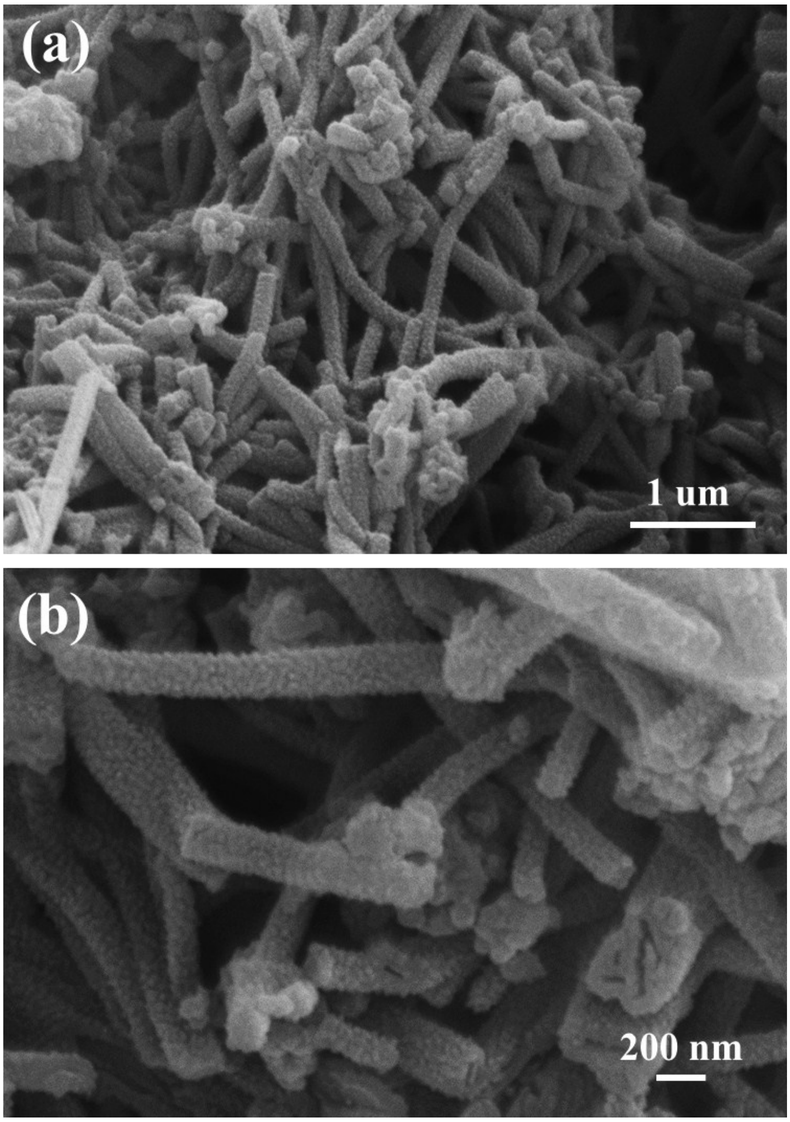

Fig. S2 SEM images (a, b) of the N-HCNFs.

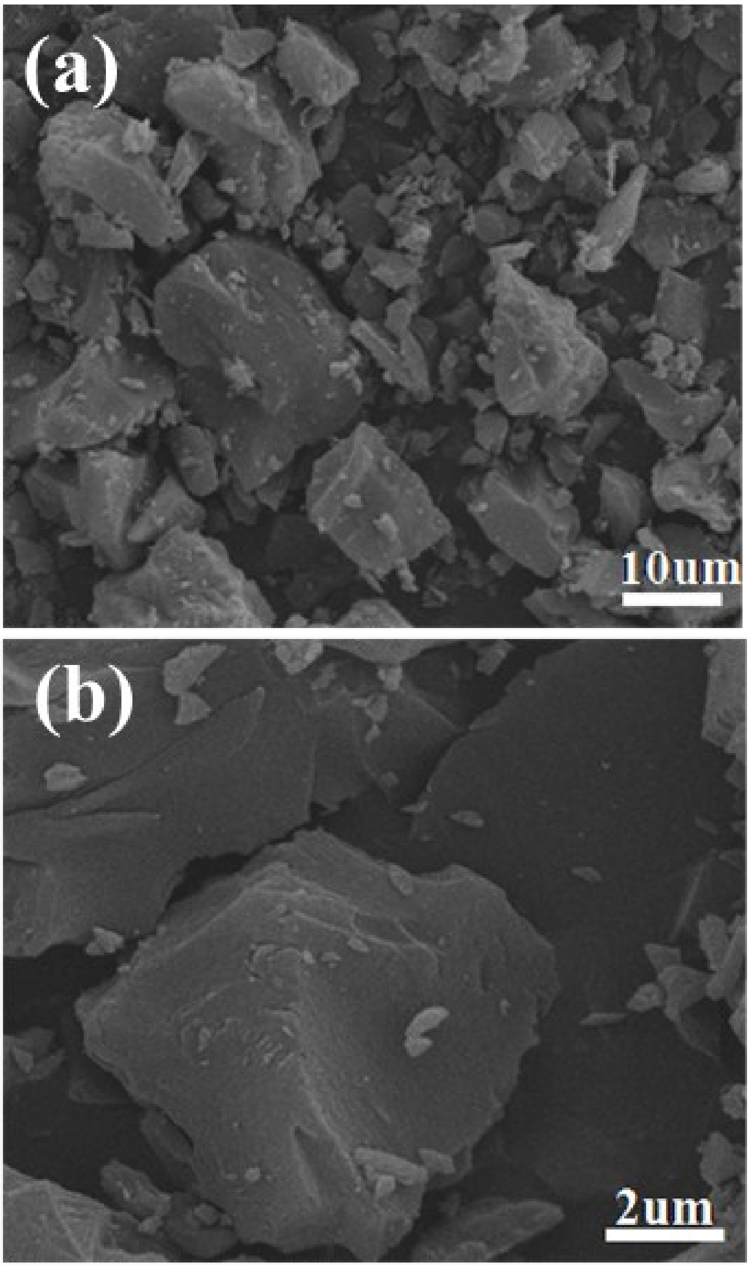

Fig. S3 SEM images (a, b) of the AC cathode.

Table S1. Elemental composition of N/S-HCNTs at different temperatures, and N-HCNTs (Atomic %).

Sample	C	O	N	S
N/CNFs	86.59%	5.54%	7.87%	
S-N/CNFs-700	84.28%	5.15%	7.44%	3.13%
S-N/CNFs-800	84.11%	5.74%	7.01%	3.15%
S-N/CNFs-900	86.47%	5.39%	5.26%	2.88%

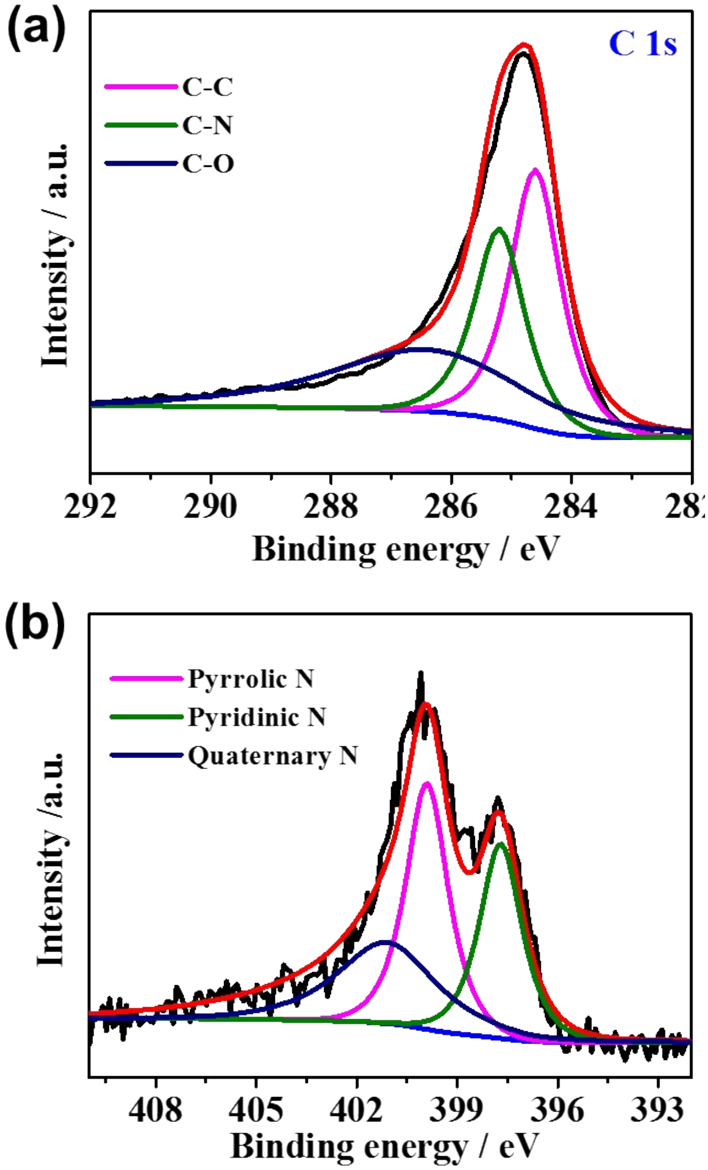

Fig. S4 High-resolution XPS spectra of C1s (a) and N1s (b) in N-HCNFs.

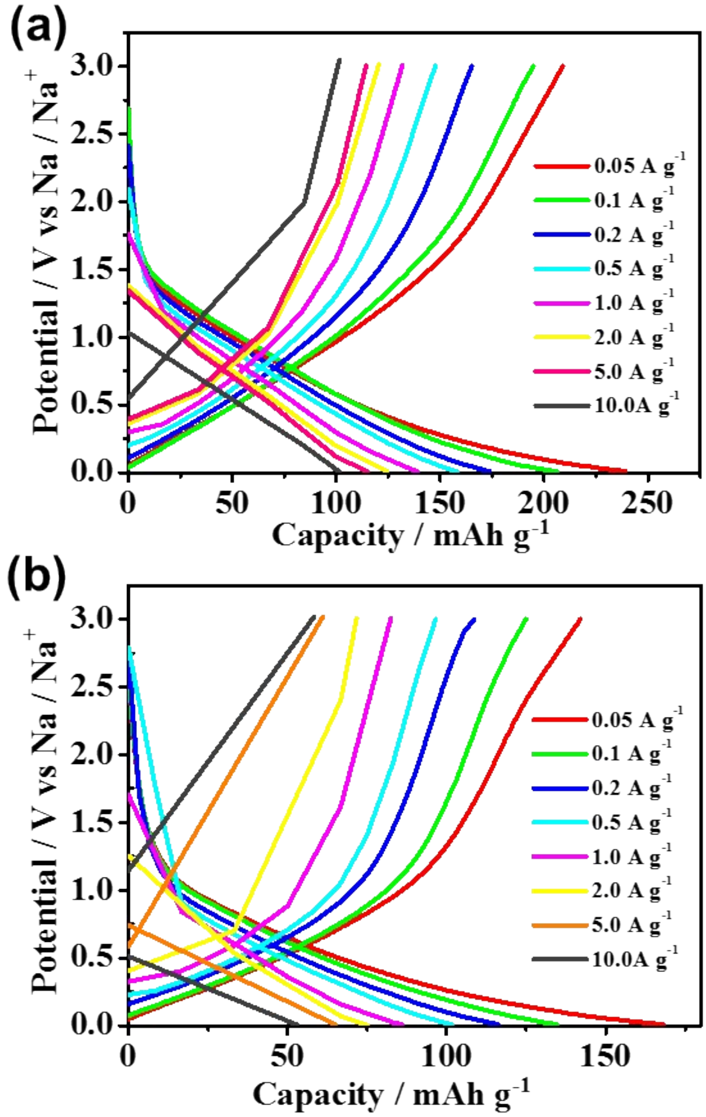

Fig. S5 Charge and discharge curves of as-synthesized N-HCNFs (a) and N-n-HCNFs (b) at different current densities.

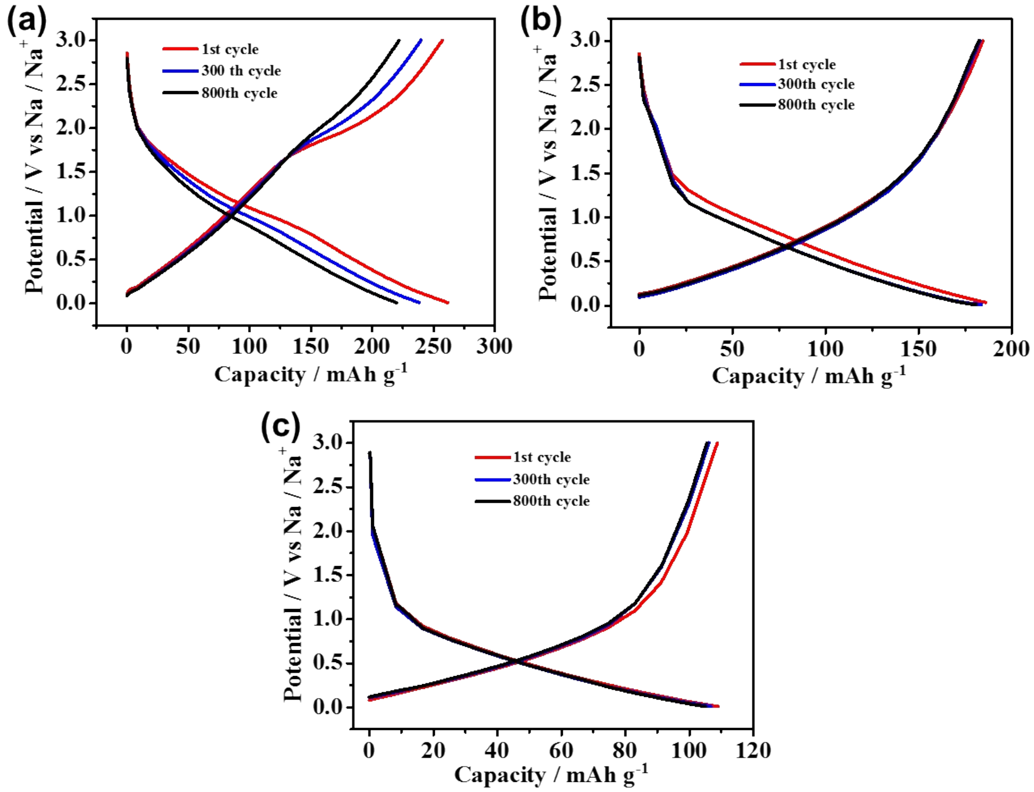

Fig. S6 Charge and discharge curves of as-synthesized N/S-HCNFs (a), N-HCNFs (b) and N-n-HCNFs (c) at 1st, 300th and 800th at 0.5 A g^{-1}.

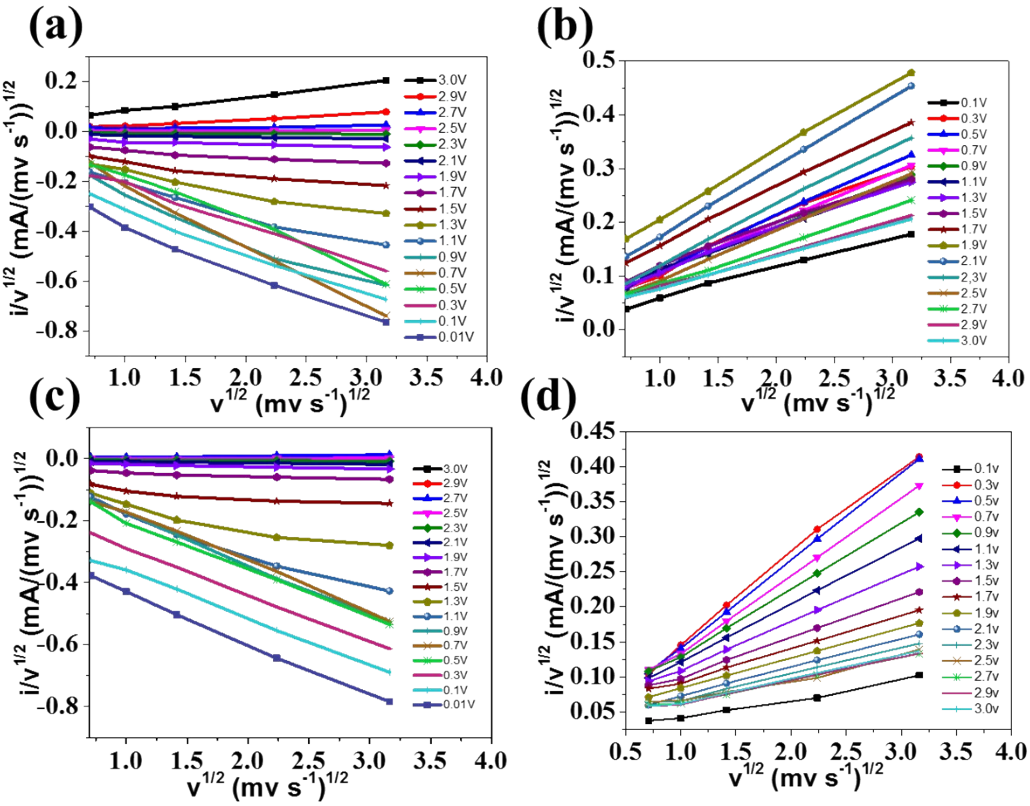

Fig. S7 The plots of $i/v^{1/2}$ vs $v^{1/2}$ used for calculating constants a_1 and a_2 for the cathodic process. of N/S-HCNFs (a) and N-HCNFs (c). The plots of $i/v^{1/2}$ vs $v^{1/2}$ used for calculating constants a_1 and a_2 for the anodic process of N/S-HCNFs (b) and N-HCNFS (d).

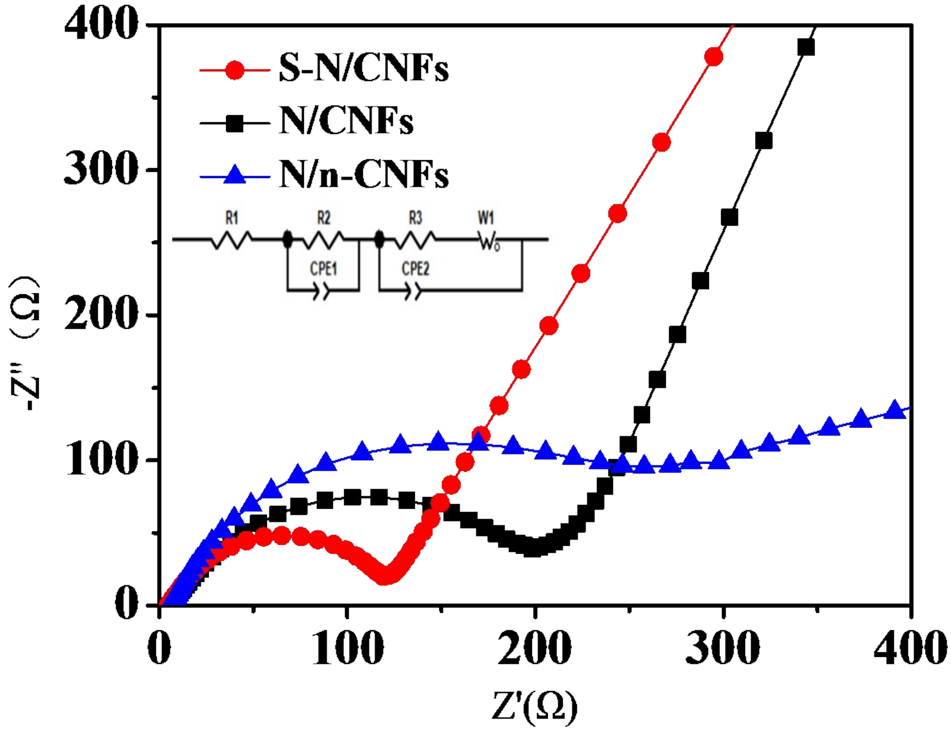

Fig. S8 Electrochemical impedance spectra (EIS) of N/S-HCNFs, N-HCNFs and N-n-HCNFs

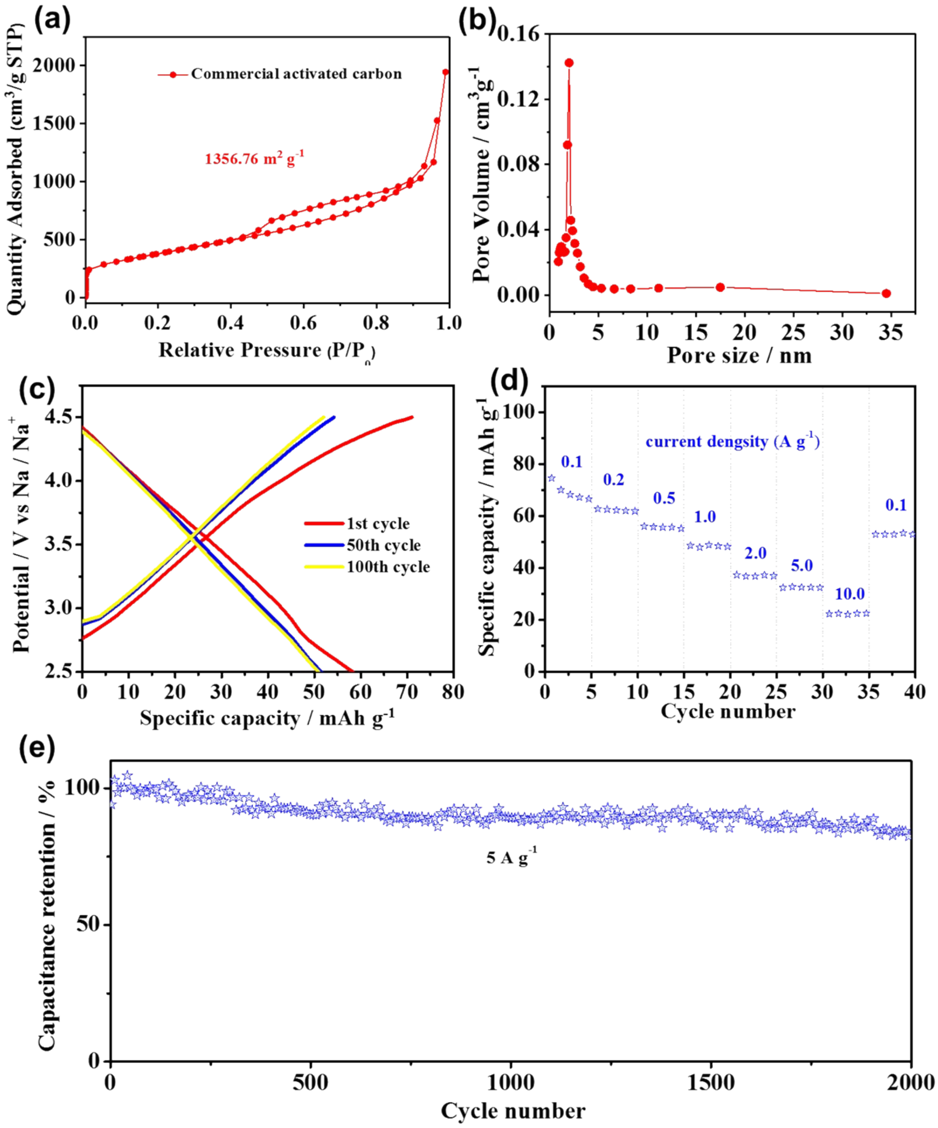

Fig. S9 Nitrogen adsorption-desorption isotherms (a) and pore size distribution (b) of commercial AC. Electrochemical properties of the AC electrode in a Na half-cell between 2.5 and 4.5 V vs. Na/Na^+. (c) Charging/discharging curves of the AC electrode at 1st, 50th and 100th at 0.1 A g^{-1}. (d) Specific capacities at different current densities. (e) Cycling performance at 5 A g^{-1}.

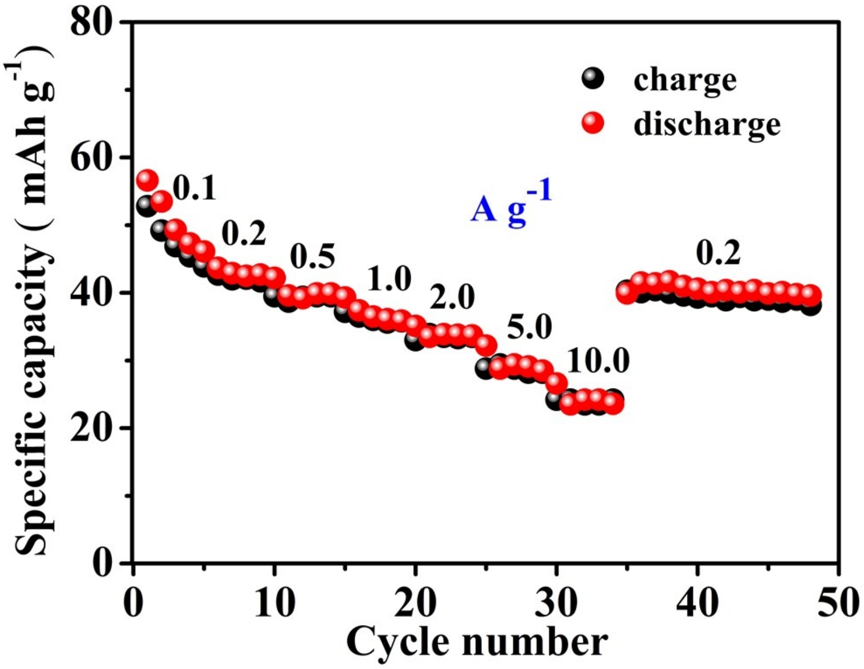

Fig. S10 Rate performance of the as-assembled NIC at different current densities based on the total mass of S-N/CNTs and AC.

Table S2 Comparison of electrochemical performances for anodes of SIBs between our N/S-HCNFs and carbon-based materials reported previously.

Anode material	**Cyclability ($mA\ h\ g^{-1}$)**	**Rate capability ($mA\ h\ g^{-1}$)**	**Refs**
N/S-HCNFs	224 at 0.5 A g^{-1} after 800 cycles; 202.3 at 5 A g^{-1} after 3000 cycles	446 at 0.05 A g^{-1}; 180 at 10 A g^{-1}	This work
Cellulose-derived carbon nanofibers	176 at 0.2 A g^{-1} after 600 cycles	255 at 0.04 A g^{-1} 85 at 2 A g^{-1}	1
Nanocellular carbon foams	137 at 0.1 A g^{-1} after 300 cycles	140 at 0.2 A g^{-1} 50 at 5A g^{-1}	2
N-doped carbon nanosheets	155 at 0.05 A g^{-1} after 200 cycles	190 at 0.2 A g^{-1} 45 at 5A g^{-1}	3
Expanded graphite	150 at 0.1 A g^{-1} after 2000 cycles	284 at 0.2 A g^{-1} 91 at 2A g^{-1}	4
Banana peel pseudographite	298 at 0.1 A g^{-1} after 300 cycles	290 at 0.2 A g^{-1} 70 at 5A g^{-1}	5
Free standing porous carbon nanofibers	266 at 0.05 A g^{-1} after 100 cycles	300 at 0.05 A g^{-1} 60 at 10A g^{-1}	6
Nanoporous hard carbon	289 at 0.02 A g^{-1} after 100 cycles	307 at 0.02 A g^{-1} 95 at 0.5A g^{-1}	7
N-doped bamboo-like carbon nanotubes	100 at 0. 5 A g^{-1} after 100 cycles	270 at 0.1 A g^{-1} 81 at 1.0A g^{-1}	8
honeycomb carbon bubbles	209 at 0. 1 A g^{-1} after 400 cycles	359 at 0.05 A g^{-1} 112 at 5.0A g^{-1}	9
S-doped disordered carbon	271 at 1.0 A g^{-1} after 1000 cycles	516 at 0.02 A g^{-1} 211 at 2.0A g^{-1}	10

N-doped carbon nanofiber films	377 at 0.1 A g^{-1} after 1000 210 at 5.0 A g^{-1} after 7000 cycles	315 at 0.02 A g^{-1} 154 at15A g^{-1}	11
Hierarchical N/S-codoped carbon	150 at 0.5 A g^{-1} after 3400 cycles	280 at 0.03 A g^{-1} 130 at 10 A g^{-1}	12
S-doped N-rich carbon nanosheets	350 at 0.05 A g^{-1} after 100 cycles; 211 at 1.0 A g^{-1} after 1000 cycles	350 at 0.05 A g^{-1} 110 at 10A g^{-1}	13
Oatmeal derived N-doped carbon Microspheres	360 at 0.05 A g^{-1} after 50 cycles; 104 at 10 A g^{-1} after 12500 cycles	330 at 0.05 A g^{-1} 102 at 10A g^{-1}	14
Rod-like ordered mesoporous carbons	159 at 0.1 A g^{-1} after 100 cycles; 100 at 0.5 A g^{-1} after 1000 cycles	230 at 0.05 A g^{-1} 120 at 1.0 A g^{-1}	15
Polydopamine derived carbon	508 at 0.05 A g^{-1} after 1000 cycles	433 at 0.1 A g^{-1} 122 at 3.0 A g^{-1}	16
3DFramework Carbon from	205 at 0.5 A g^{-1} after 1000 cycles;79 at 10A g^{-1} after 1000cycles	426 at 0.1 A g^{-1} 77 at 10.0 A g^{-}	17

Table S3 Comparison of electrochemical performances of other reported AC-based NICs or LICs with our NIC.

Materials (anode//cathode)	Energy density (Wh kg^{-1})	Power density (W kg^{-1})	Cycling stability	Ref
S-N/CNTs//AC	116.12	20000	81%, 3000cycles	This work
PI-2.5//AC(PI-5)	66	1200	82.4%,1000cycles	[18]
CS-800//CS-800-6	52.2	3000	85.7%,2000cycles	[19]
NVP@AC//NVP@AC	26	5424	64.5%,10000cycles	[20]
$Na_2Ti_3O_7$-CNT//AC	58.5	3000	75%, 4000 cycles	[21]
Nb_2O_5@C/rGO//AC	76	80	100%,3000cycles	[22]
$NiCo_2O_4$//AC	13.8	308	61.2%2000 cycles	[23]
Na-TNT//AC	34	889	80%,1000cycles	[24]

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