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Supporting Information for

Excellent energy – power characteristics from a hybrid sodium ion capacitor based on identical carbon nanosheets in both electrodes

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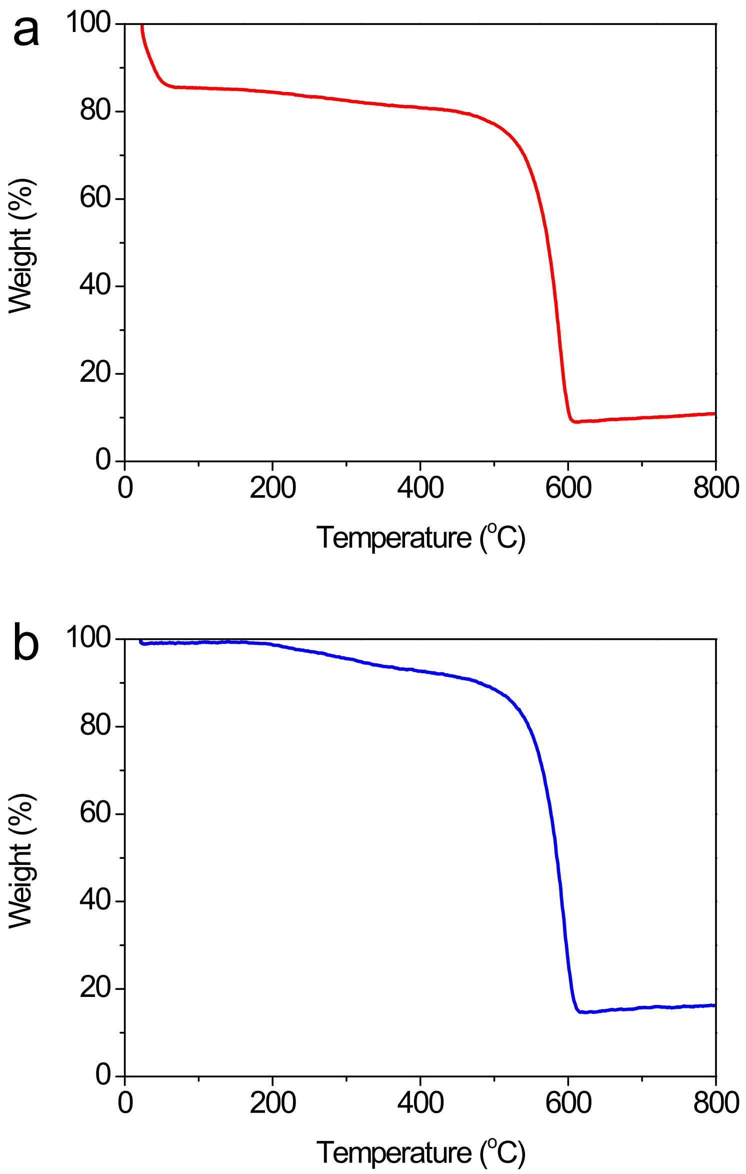

Fig. S1 TG curves of the as obtained (a) SCN and (b) SCN-A at a heating rate of 10 °C min^{-1} in air.

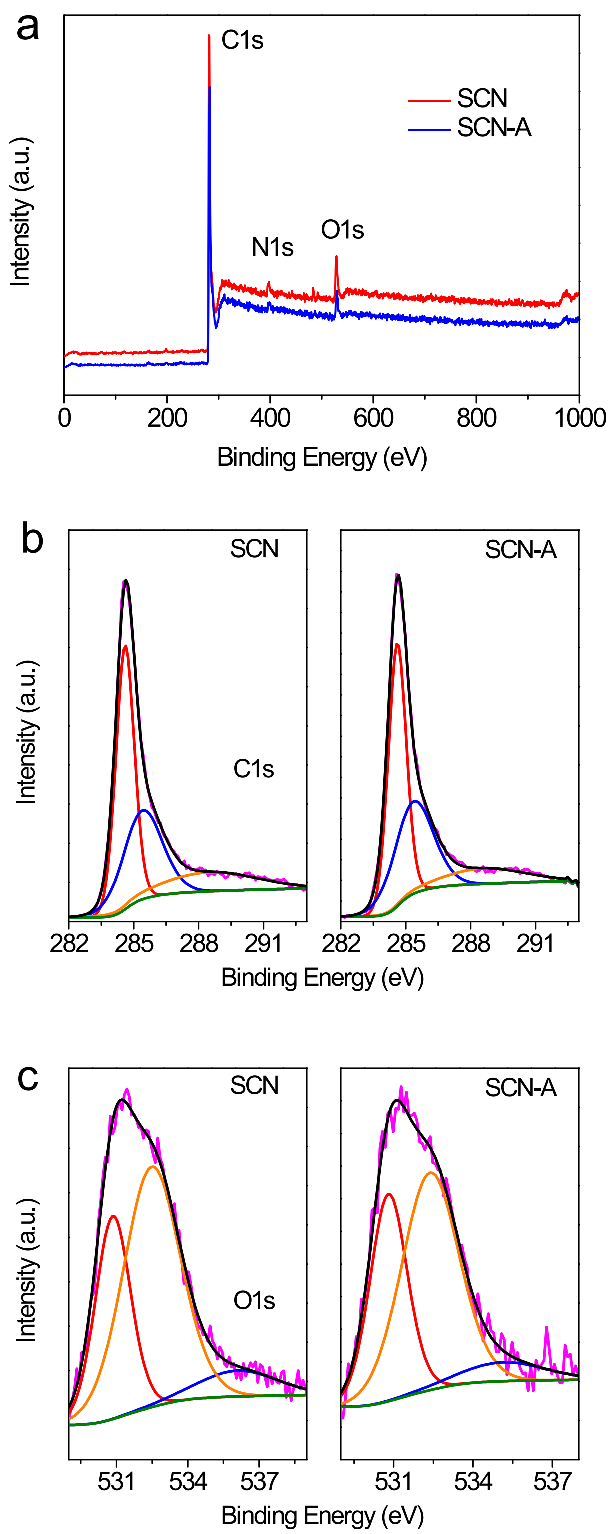

Fig. S2 (a) XPS survey spectra of SCN and SCN-A samples. High-resolution (b) C 1s and (c) O 1s spectra of samples SCN and SCN-A.

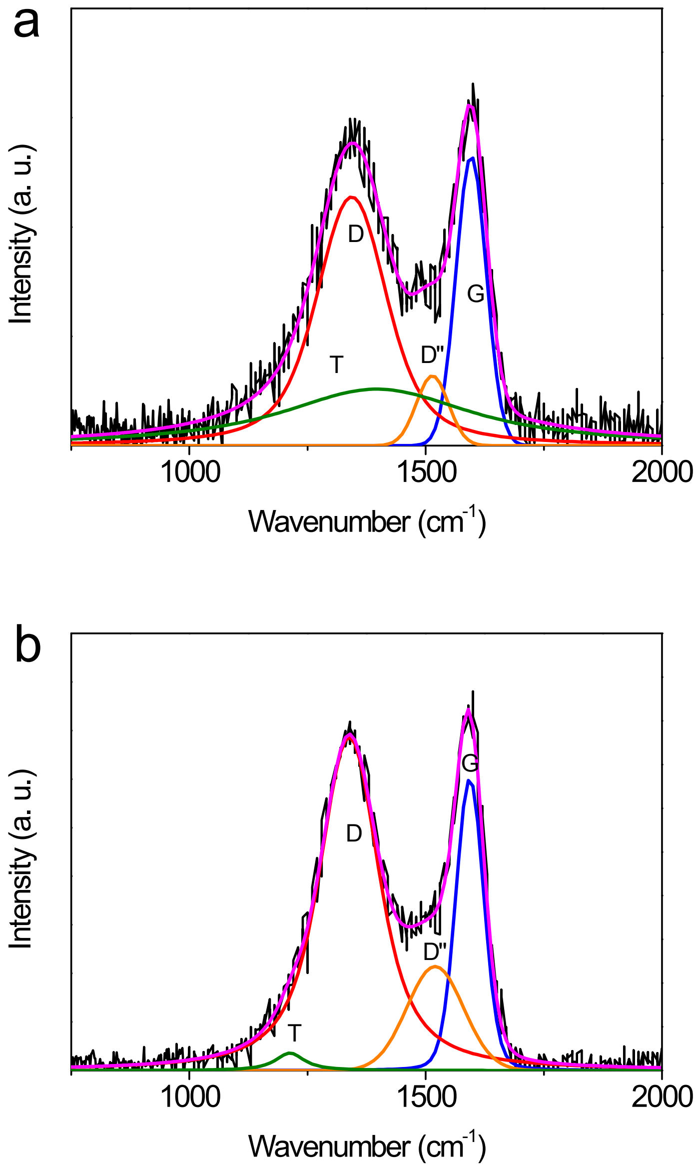

Fig. S3 Fitted Raman spectra of (a) SCN and (b) SCN-A specimens.

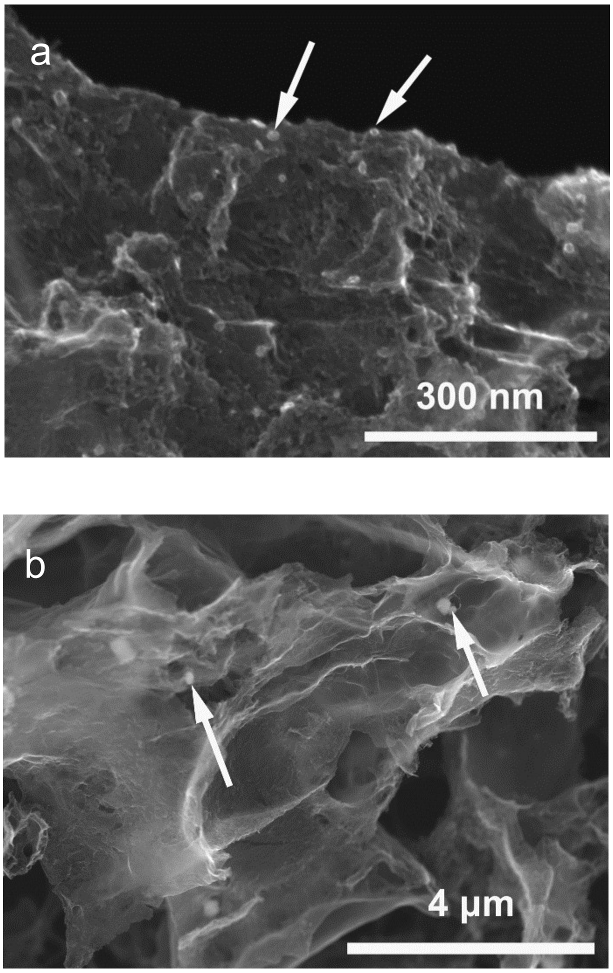

Fig. S4 SEM images of (a) SCN, and (b) SCN-A. The arrows indicate the possible position of the iron oxide.

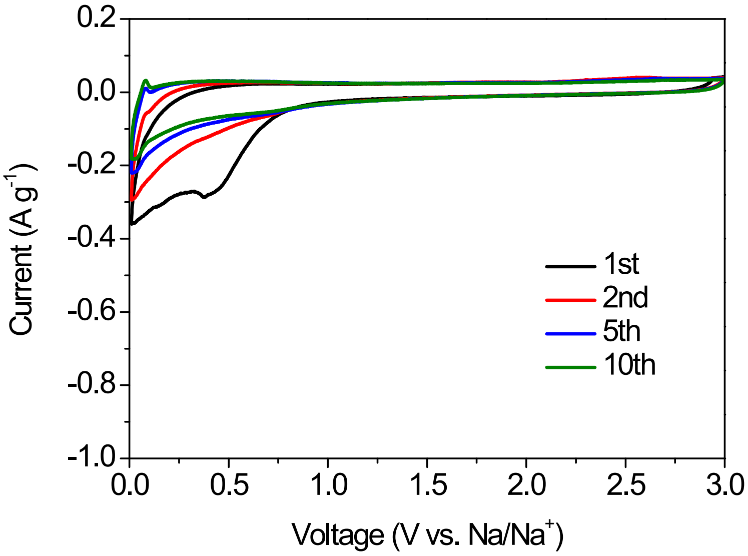

Fig. S5 CV curves of SCN electrode between 0.01 and 3.0 V vs. Na/Na^+, at a scan rate of 0.01 mV s^{-1}.

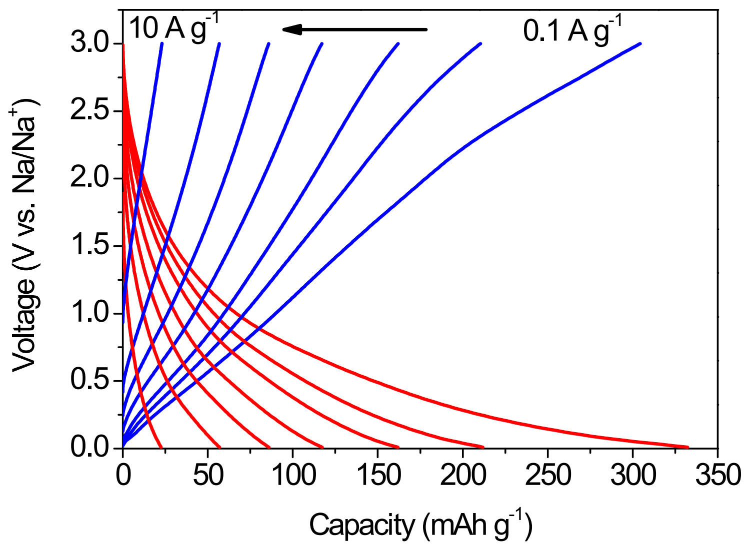

Fig. S6 Charge (blue) and discharge (red) curves of SCN-A electrodes in every fifth cycle between 0.01 and 3.0 V versus Na/Na^+ at various current densities.

Table S1 A comparison with literature of the reversible capacities of state-of-art carbonaceous materials as anode for sodium ion batteries.

Samples	Initial coulombic efficiency (%)	Cyclability	Rate capability
Nitrogen-doped carbon nanosheets[1]	34.9	155.2 mAh g^{-1} at 260th cycle and 0.05 A g^{-1}; 80 mAh g^{-1} at 400th cycle and 1 A g^{-1};	323.1 mAh g^{-1} at 0.1 A g^{-1}; 88.9 mAh g^{-1} at 1 A g^{-1}; 50 mAh g^{-1} at 20 A g^{-1};
Hollow carbon nanospheres[2]	41.5	~160 mAh g^{-1} at 100th cycle and 0.1 A g^{-1};	168 mAh g^{-1} at 0.1 A g^{-1}; 120 mAh g^{-1} at 1 A g^{-1}; 50 mAh g^{-1} at 10 A g^{-1};
Hollow carbon nanowires[3]	50.5	~206.3 mAh g^{-1} at 400th cycle and 0.05 A g^{-1};	252 mAh g^{-1} at 0.05 A g^{-1}; 216 mAh g^{-1} at 0.25 A g^{-1}; 149 mAh g^{-1} at 0.5 A g^{-1};
Templated carbon[4]	~20	~120 mAh g^{-1} at 40th cycle and 0.074 A g^{-1}; ~80 mAh g^{-1} at 125th cycle and 0.074 A g^{-1};	~140 mAh g^{-1} at 0.074 A g^{-1}; ~120 mAh g^{-1} at 0.74 A g^{-1}; ~100 mAh g^{-1} at 1.85 A g^{-1};
Highly disordered carbon[5]	57.6	225 mAh g^{-1} at 180th cycle and 0.1 A g^{-1};	231 mAh g^{-1} at 0.1 A g^{-1}; 102 mAh g^{-1} at 1 A g^{-1}; 18 mAh g^{-1} at 10 A g^{-1};
N-doped interconnected carbon nanofibers[6]	41.8	134.2 mAh g^{-1} at 200th cycle and 0.2 A g^{-1};	150 mAh g^{-1} at 0.2 A g^{-1}; 132 mAh g^{-1} at 1 A g^{-1}; 87 mAh g^{-1} at 10 A g^{-1};
Carbon nanosheet[7]	57.5	255 mAh g^{-1} at 210th cycle and 0.1 A g^{-1};	204 mAh g^{-1} at 0.5 A g^{-1}; 150 mAh g^{-1} at 1 A g^{-1}; 66 mAh g^{-1} at 5A g^{-1};
Banana peel pseudographite[8]	67.8	298 mAh g^{-1} at 290th cycle and 0.1 A g^{-1};	290 mAh g^{-1} at 0.2 A g^{-1}; 155 mAh g^{-1} at 1 A g^{-1}; 70 mAh g^{-1} at 5A g^{-1};
N-doped ordered mesoporous carbon[9]	-	327.6 mAh g^{-1} at 45th cycle and 0.1 A g^{-1};	259 mAh g^{-1} at 0.2 A g^{-1}; 157 mAh g^{-1} at 1 A g^{-1}; 98 mAh g^{-1} at 2A g^{-1};
Nitrogen-doped carbon nanotubes[10]	< 30	no capacity fading between 60th and 160th at 0.5 A g^{-1};	167 mAh g^{-1} at 0.1 A g^{-1}; 104 mAh g^{-1} at 0.5 A g^{-1}; 81 mAh g^{-1} at 1 A g^{-1};
Carbon bubbles[11]	52	209 mAh g^{-1} at 400th cycle and 0.1 A g^{-1}; 122 mAh g^{-1} at 1000th cycle and 1 A g^{-1};	359 mAh g^{-1} at 0.1 A g^{-1}; 179 mAh g^{-1} at 0.5 A g^{-1}; 136 mAh g^{-1} at 2 A g^{-1};
Nitrogen-doped carbon sheets[12]	26.4	165 mAh g^{-1} at 600th cycle and 0.2 A g^{-1};	212 mAh g^{-1} at 0.1 A g^{-1}; 113 mAh g^{-1} at 1 A g^{-1}; 84 mAh g^{-1} at 5 A g^{-1};
Nitrogen-doped carbon sphere[13]	39.9	206 mAh g^{-1} at 600th cycle and 0.2 A g^{-1};	237 mAh g^{-1} at 0.1 A g^{-1};

			184 mAh g^{-1} at 0.5 A g^{-1}; 155 mAh g^{-1} at 1 A g^{-1};
Hard carbon[14]	62.8-69.2	352 mAh g^{-1} at 200th cycle and 0.05 A g^{-1};	317.7 mAh g^{-1} at 0.1 A g^{-1}; 78.3 mAh g^{-1} at 2 A g^{-1};
Peanut skin derived carbon nanosheets (this work)	24.2-29.6	185 mAh g^{-1} at 1000th cycle and 0.5 A g^{-1};	198 mAh g^{-1} at 0.5 A g^{-1}; 164 mAh g^{-1} at 1 A g^{-1}; 73 mAh g^{-1} at 10A g^{-1};

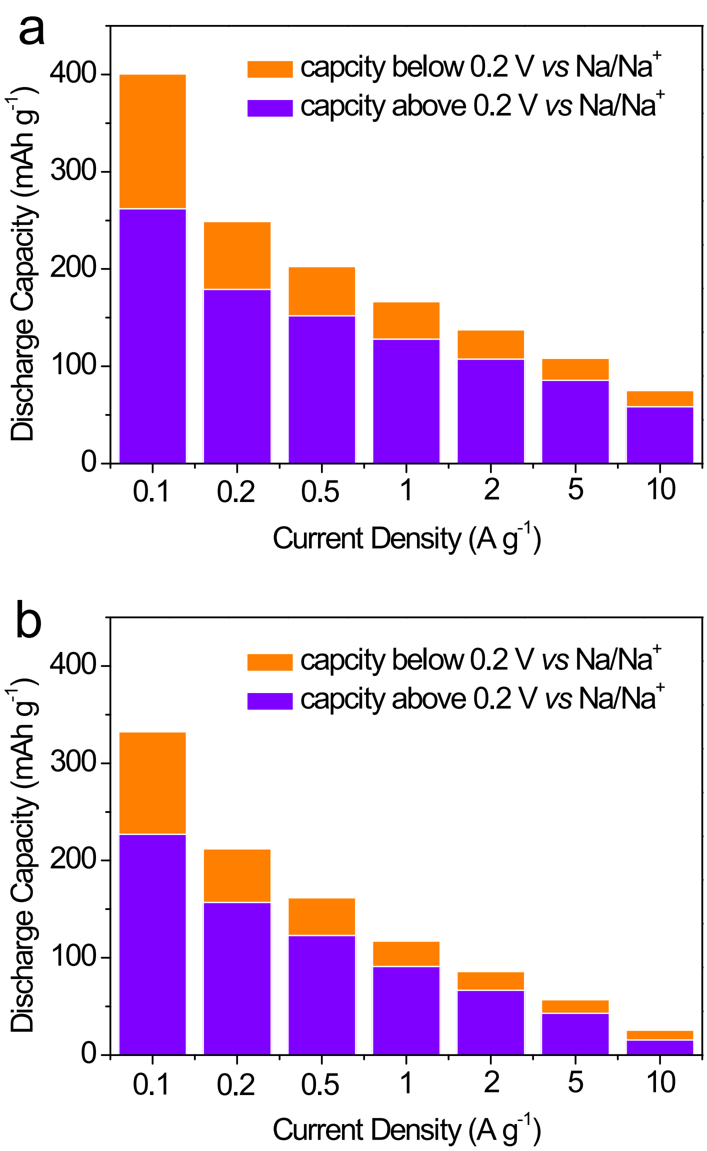

Fig. S7. Summary of capacity above and below 0.2V versus voltage for (a) SCN-A and (b) SCN electrodes (5th cycle at each current).

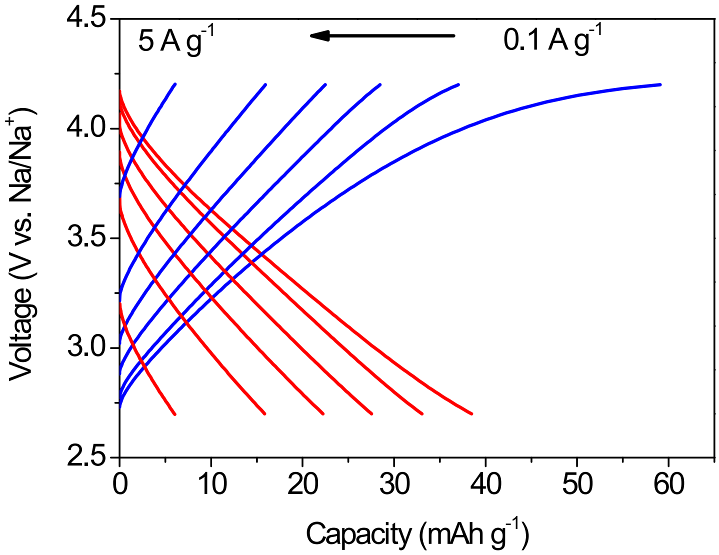

Fig. S8 Charge (blue) and discharge (red) curves of SCN at various current densities, tested between 2.7 and 4.2 V versus Na/Na^+.

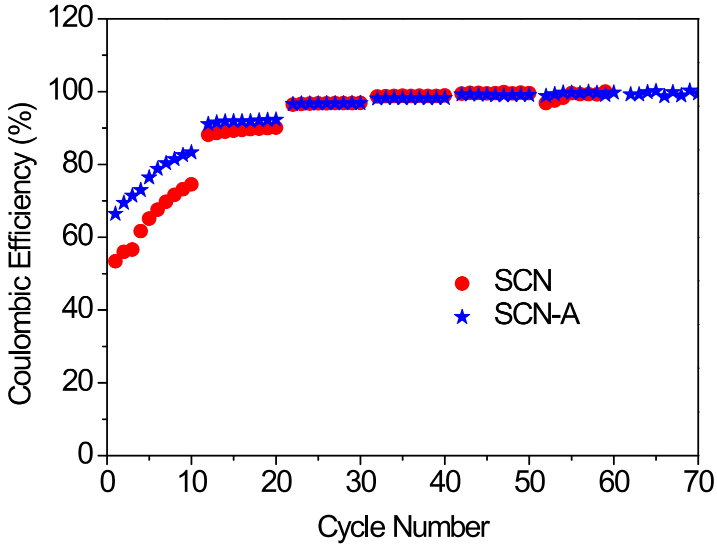

Fig. S9 The coulombic efficiency of SCN and SCN-A cathodes during the rate capability measurements shown in Figure 4a.

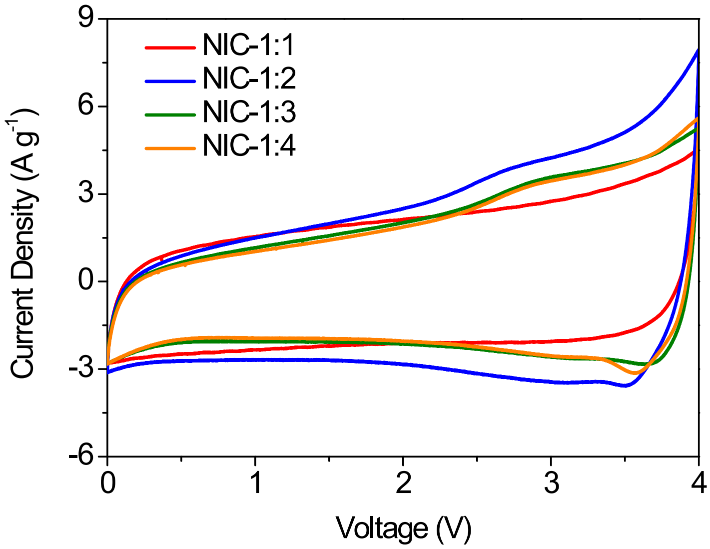

Fig. S10 CV curves of SCN-A//SCN-A hybrid Na-ion capacitors with different cathode to anode mass ratios, tested at 20 mV s^{-1}.

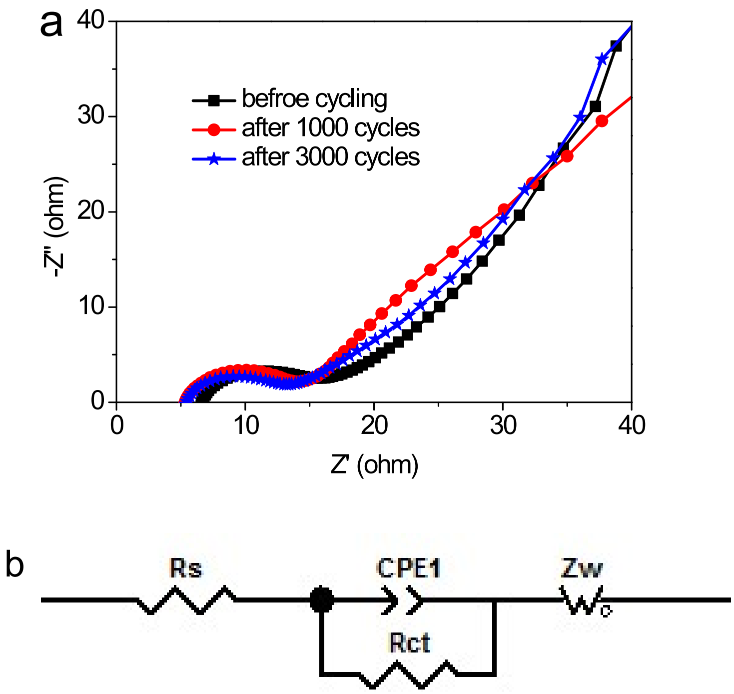

Fig. S11 (a) Nyquist plots of Na-ion capacitors with anode to cathode mass ratio of 1:2 before test, after 1000 cycles and after 3000 cycles. (b) Equivalent circuit used for fitting the experimental data. R_s is the total resistance of electrolyte, electrode, current collector and separator. R_{ct} is the charge transfer resistance. CPE_1 represents a capacitance element coupled with R_{ct}, typically assigned to the double layer capacitance or chemical capacitance. Z_w is the Warburg impedance related to the diffusion of lithium ions into the bulk electrode.

References

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