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

Supporting Information for

N, O-codoped hierarchical porous carbons derived from algae for high-capacity supercapacitors and battery anodes

Wenhua Yu, Huanlei Wang, * Shuang Liu, Nan Mao, Xiao Liu, Jing Shi, Wei Liu, Shougang Chen, and Xin Wang

Institute of Materials Science and Engineering, Ocean University of China, Qingdao 266100, China

* Email:huanleiwang@gmail.com; huanleiwang@ouc.edu.cn.

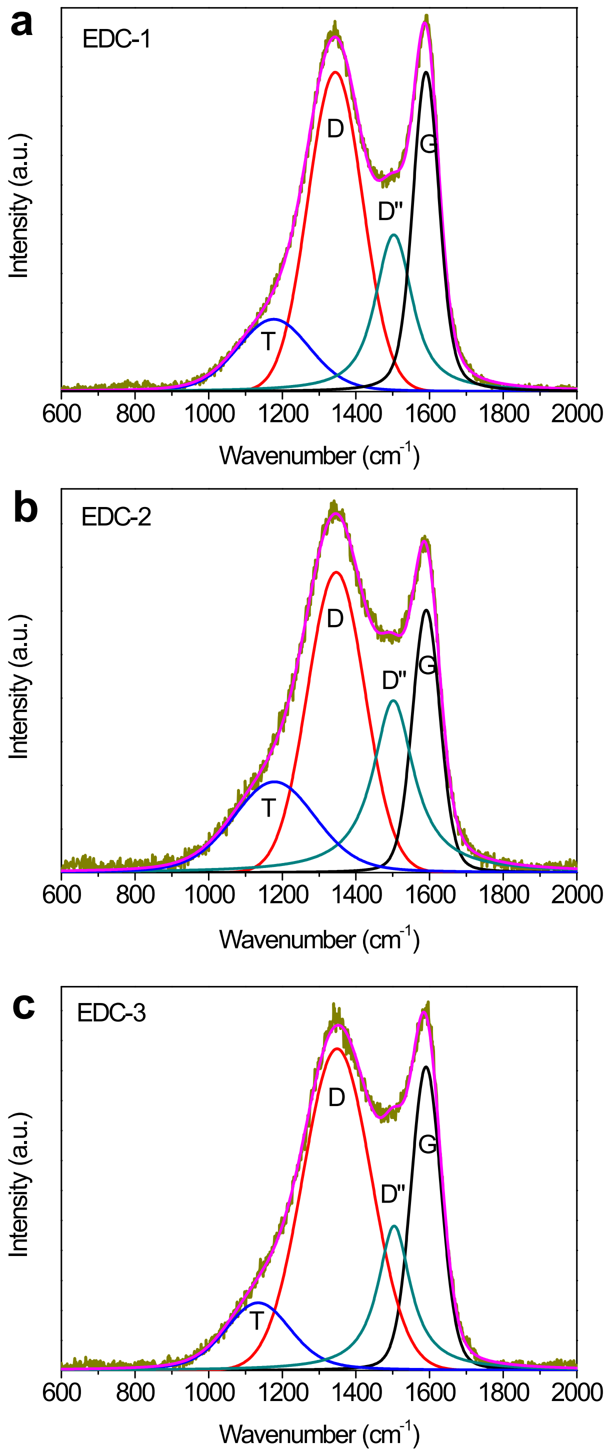

Fig. S1 Fitted Raman spectra of (a) EDC-1, (b) EDC-2, and (c) EDC-3 specimens by using Voigt function.

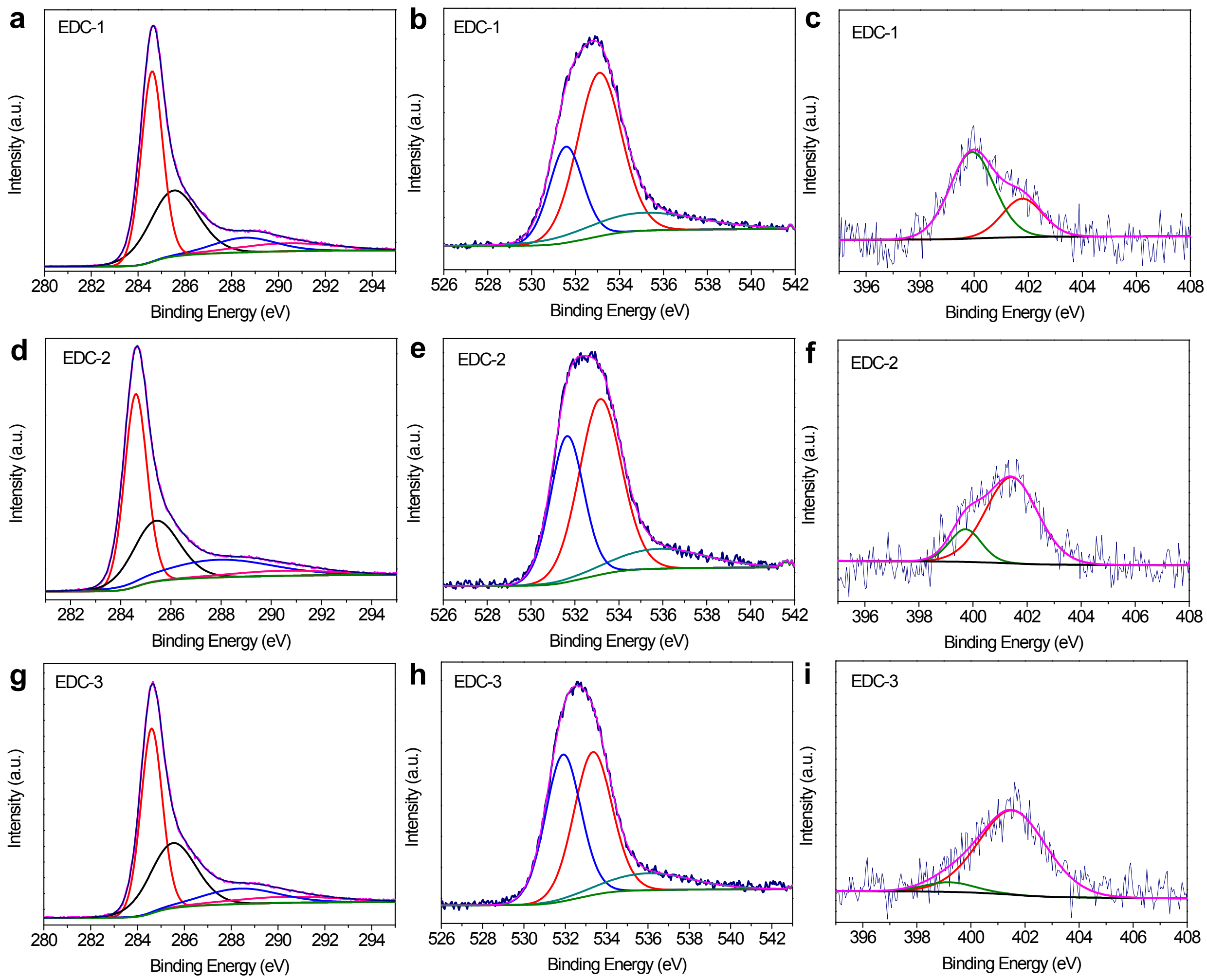

Fig. S2 High-resolution XPS (a) C1s, (b) O 1s, and (c) N 1s spectra of EDC-1. High-resolution XPS (d) C1s, (e) O 1s, and (f) N 1s spectra of EDC-2. High-resolution XPS (g) C1s, (h) O 1s, and (i) N 1s spectra of EDC-3.

Table S1 Relative surface concentrations (%) of nitrogen and oxygen species obtained by fitting the N 1s and O 1s core level XPS spectra.

Sample	N-5	N-Q	O-I	O-II	O-III
EDC-1	71.04	28.96	25.93	57.61	16.46
EDC-2	18.75	81.25	34.53	53.29	13.07
EDC-3	7.94	92.06	42.84	44.97	12.19

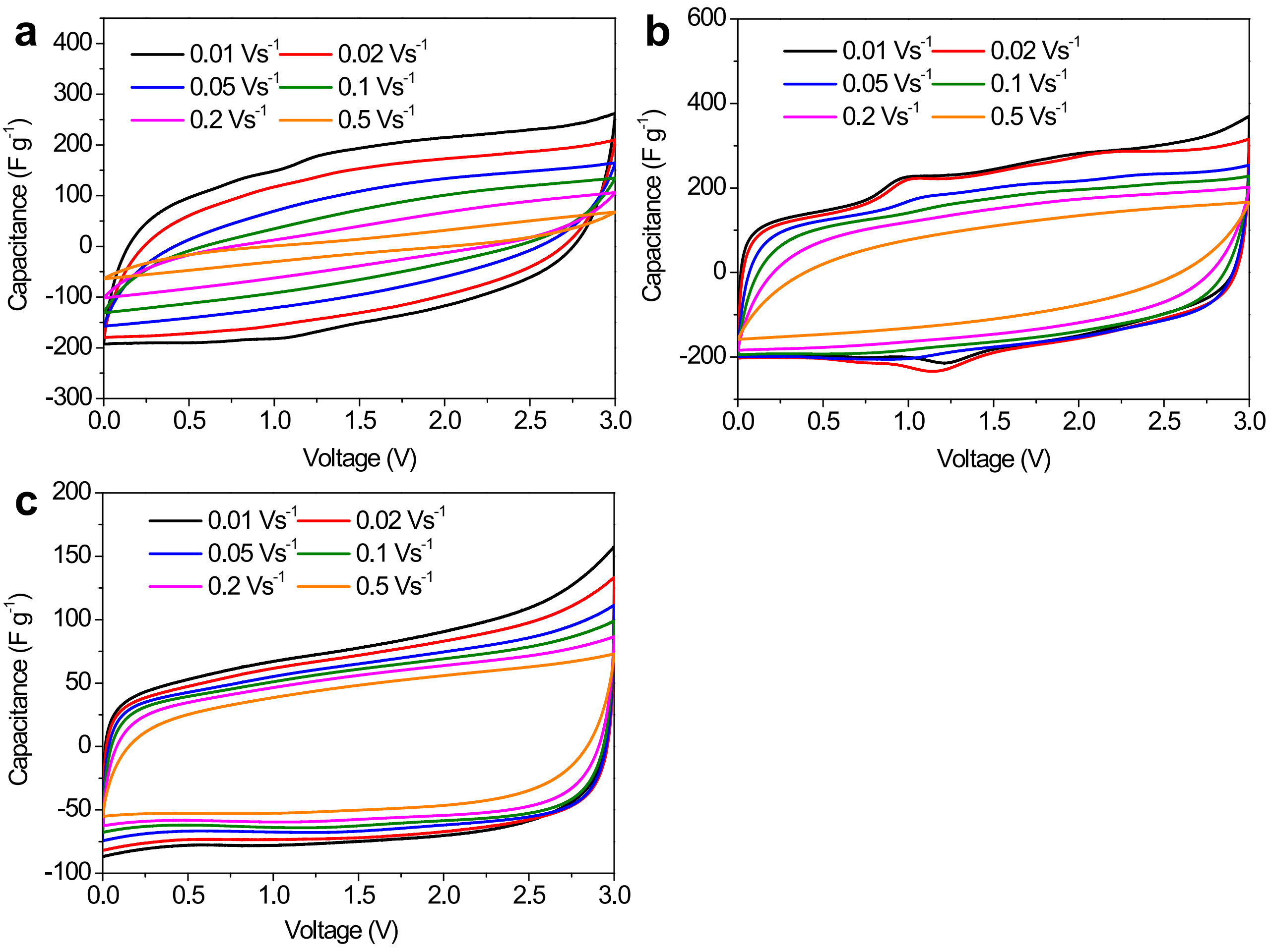

Fig. S3 CV curves of (a) EDC-1, (b) EDC-2, and (c) AC for different scan rates, tested at 20 °C.

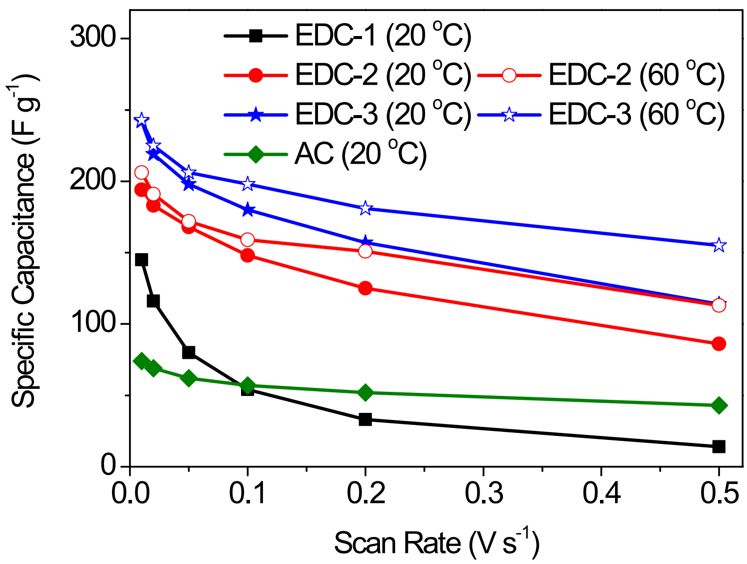

Fig. S4 Specific capacitance as a function of scan rates.

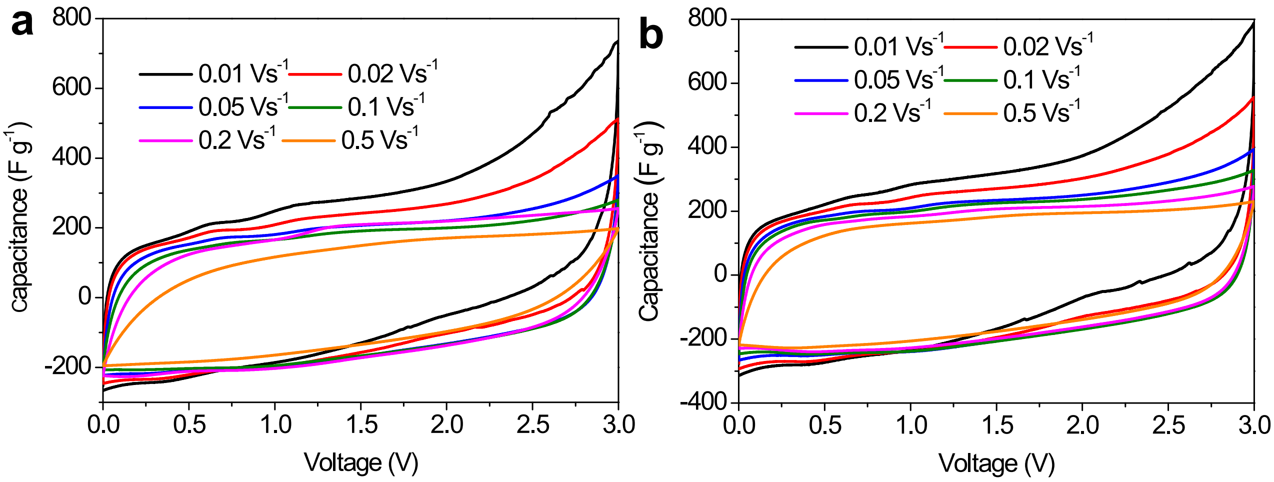

Fig. S5 CV curves of (a) EDC-2 and (b) EDC-3 for different scan rates, tested at 60 °C.

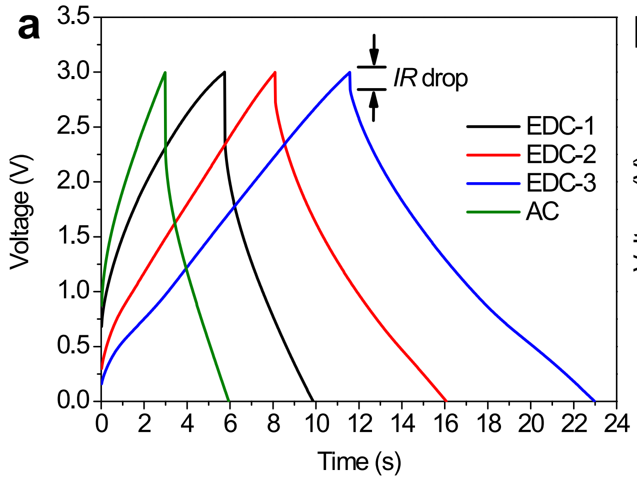

Fig. S6 Galvanostatic charge-discharge profiles of EDCs and AC, tested at a current density of (a) 20 A g^{-1}, and (b) 50 A g^{-1}.

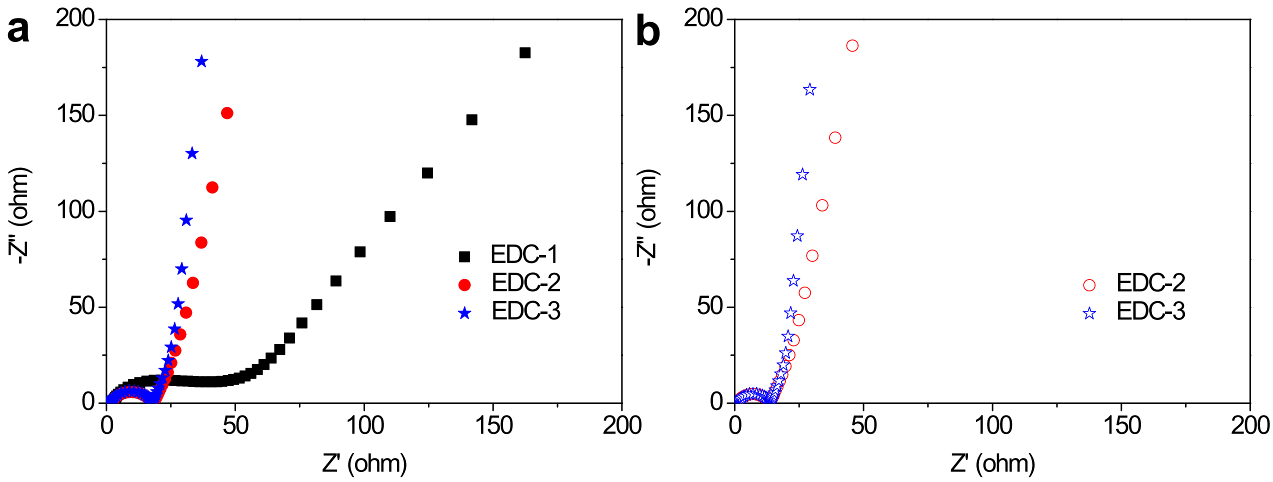

Fig. S7 Nyquist plots of the EDC electrodes in ionic liquid electrolyte, tested at (a) 20 ^{o}C and (b) 60 ^{o}C.

Table S2 Comparison of capacitance and energy density of carbon-based electrodes for supercapacitors.

Sample	Electrolyte	Testing temperature	Capacity at low current	Capacity at high current	Capacity retention	Cyclability	Voltage	Maximum Energy	Energy at high power
3D ordered mesoporous carbon[1]	EMI-TFSI	20 ^{o}C	146−178 F g^{-1} (0.5 A g^{-1})	80−123 F g^{-1} (25 A g^{-1})	> 50 % (0.5-25 A g^{-1})	90% after 1000 cycles (5 A g^{-1})	0-3.5	-	-
3D Carbon[2]	$EMIMBF_4$	20 ^{o}C	196 F g^{-1} (0.5 A g^{-1})	133 F g^{-1} (10 A g^{-1})	67.8 % (0.5-10 A g^{-1})	-	0-3.5	91.4 Wh kg^{-1}	70 Wh kg^{-1} (1223 W kg^{-1})
carbons derived from biowaste[3]	EMIM TFSI	60 ^{o}C	161.5 F g^{-1} (0.1 A g^{-1})	95.3 F g^{-1} (10 A g^{-1})	59 % (0.1-10 A g^{-1})	91% after 5000 cycles（10 A g^{-1}）	0-3	51 Wh kg^{-1} (375 W kg^{-1})	26–31Wh kg^{-1} (6760–7000 W kg^{-1})
	BMPY TFSI		163.3 F g^{-1} (0.1 A g^{-1})	121.7 F g^{-1} (10 A g^{-1})	74.5 % (0.1-10 A g^{-1})				
Nitrogen-doped carbon nanosheets[4]	$EMIMBF_4$	20 ^{o}C	242 F g^{-1} (0.1 Ag^{-1})	155 F g^{-1} (10 Ag^{-1})	64 % (0.1-10 A g^{-1})	92% after 10000 cycles (2A g^{-1})	0-3.5	90 Wh kg^{-1} (875 W kg^{-1})	52.5 W h kg^{-1} (8750 W kg^{-1})
Interconnected carbon nanosheets[5]	BMPY TFSI	0-100 ^{o}C	157 F g^{-1} (1 A g^{-1}, 20 ^{o}C)	113 F g^{-1} (100 A g^{-1}, 20 ^{o}C)	72% (0.1-100 A g^{-1})	96% after 10000 cycles at 10Ag^{-1} (60^{o}C)	0-3	-	19, 34 and 40 Wh kg^{-1} at 20 kW kg^{-1} (20, 60, 100 ^{o}C)
Microporous carbon nanoplates[6]	$BMIMBF_4$ /AN	20 ^{o}C	168 F g^{-1} (0.8 A g^{-1})	-	-	96.5 % after 10000 cycles (2.5 A g^{-1})	0-3.5	-	-
Nanocarbons[7]	$EMIMBF_4$	20 ^{o}C	145 F g^{-1} (0.5 A g^{-1})	120 F g^{-1} (2 A g^{-1})	-	-	0-4	80 Wh kg^{-1}	-
N-doping mesoporous carbon[8]	EMI-TFSI	20 ^{o}C	237 F g^{-1} (0.1 A g^{-1})	151 F g^{-1} (10 A g^{-1})	63.7 % (0.1-10 A g^{-1})	~95% after 1000 cycles (1 A g^{-1})	0-3.5	83 Wh kg^{-1}	-
Shape-controlled porous nanocarbons	$EMIMBF_4$	20 ^{o}C	140 F g^{-1} (1 A g^{-1})	105.9 F g^{-1} (50 A g^{-1})	75.6 % (1-50 A g^{-1})	-	0-3.5	56.6 Wh kg^{-1}	50.5 Wh kg^{-1} (17.4 kW kg^{-1})

9									
Activated graphene-based carbons[10]	BMIM TFSI /AN	20 ^{o}C	173 F g^{-1} (2.1 A g^{-1})	174 F g^{-1} (8.4 A g^{-1})	-	94% after 1000 cycles (2Ag^{-1}) (EMIMTFSI)	0-3.5	74 Wh kg^{-1}	-
	$BMIMBF_4$ /AN		167 F g^{-1} (2.1 A g^{-1})	167 F g^{-1} (8.4 A g^{-1})	-				
Porous 3D graphene-based bulk Material[11]	$EMIMBF_4$	20 ^{o}C	231 F g^{-1} (1 A g^{-1})	210 F g^{-1} (10 A g^{-1})	90.9 % (1-10 A g^{-1})	94% after 5000 cycles (1A g^{-1})	0-3.5	98 Wh kg^{-1}	-
rGO + SWCNT[12]	$BMIMBF_4$	20 ^{o}C	222 F g^{-1} (1 A g^{-1})	-	-	99% after 1000 cycles (1A g^{-1})	0-3.5	106.6 Wh kg^{-1} (1.19 kW kg^{-1})	58.9 Wh kg^{-1} (10.9 kW kg^{-1})
Carbon nanotube spaced graphene aerogels[13]	$EMIMBF_4$	20 ^{o}C	183.3 F g^{-1} (0.5 A g^{-1})	154.3 F g^{-1} (10 A g^{-1})	84.1% (0.5-10 A g^{-1})	94% after 2000 cycles (2 A g^{-1})	0-3.5	8.5 Wh kg^{-1} (438 W kg^{-1})	65.6 Wh kg^{-1} (9.1 kW kg^{-1})
Carbon naotube-bridged graphene[14]	$EMIMBF_4$	20 ^{o}C	199 F g^{-1} (0.5 A g^{-1})	99 F g^{-1} (20 A g^{-1})	49.7 % (0.5-20 A g^{-1})	98.2% after 10000 cycles (10 A g^{-1})	0-4	110.6 Wh kg^{-1}	-
Porous carbons[15]	$EMIMBF_4$	25^{o}C	146.5 F g^{-1} (1 A g^{-1})	50.2 F g^{-1} (20Ag^{-1})	34.3 % (1-20 A g^{-1})	85.7% after 5000 cycles (10 A g^{-1})	-1.5-1.5	-	-
		50^{o}C	220.3 F g^{-1} (1 A g^{-1})	96.5 F g^{-1} (20 A g^{-1})	43.8 % (1-20 A g^{-1})	92.5% after 5000 cycles (10 A g^{-1})			
		80^{o}C	295.6 F g^{-1} (1 A g^{-1})	110.2 F g^{-1} (20 A g^{-1})	37.3 % (1-20 A g^{-1})	92.9% after 5000 cycles (10 A g^{-1})			
Hierarchical nanoporous Carbon1[6]	EMIM TFSI	60 ^{o}C	146 F g^{-1} (0.2 A g^{-1})	108 F g^{-1} (50 A g^{-1})	74 % (0.2-50 A g^{-1})	95% after 5000 cycles (1 A g^{-1})	0-3.5	58.6 W h kg^{-1} (166 W kg^{-1})	43.3 Wh kg^{-1} (42 000 W kg^{-1})
Carbons from renewable sources[17]	EMIM TFSI	20 ^{o}C	170 F g^{-1} (1 A g^{-1})	140 F g^{-1} (60 A g^{-1})	82 % (1-60 A g^{-1})	90% after 10000 cycles (10 A g^{-1})	0-3	50-60 Wh kg^{-1}	20 Wh kg^{-1} (42 kW kg^{-1})
		60 ^{o}C	180Fg^{-1} (1 A g^{-1})	130 F g^{-1} (120 A g^{-1})	72 % (1-120 A g^{-1})				20 Wh kg^{-1} (55 kW kg^{-1})
EDCs (this work)	$EMIMBF_4$	20 ^{o}C	201 F g^{-1} (1 A g^{-1})	122 F g^{-1} (100 A g^{-1})	61 % (1-100 A g^{-}	91% after 10000	0-3	62 Wh kg^{-1}	24 Wh kg^{-1} (60 kW kg^{-1})

				^{1})	cycles (10 A g^{-1})		
	60 ^{o}C	196 F g^{-1} (1 A g^{-1})	140 F g^{-1} (100 A g^{-1})	72 % (1-100 A g^{-1})			35 Wh kg^{-1} (60 kW kg^{-1})

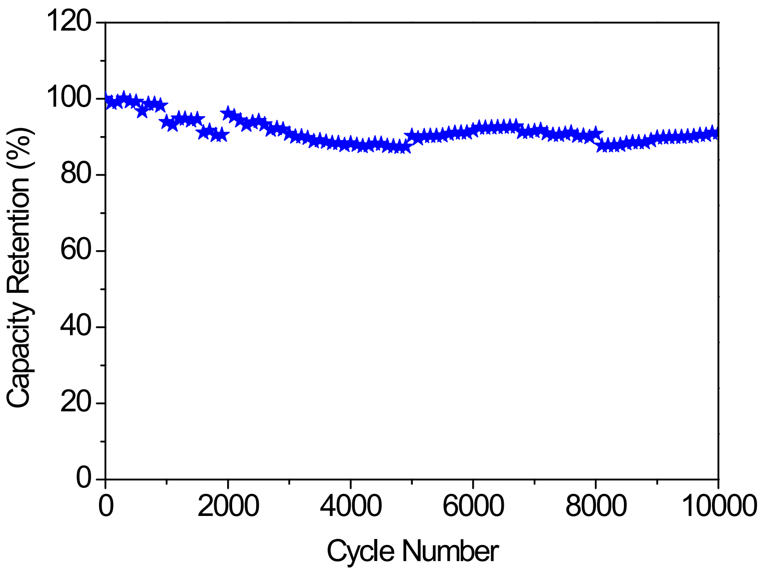

Fig. S8 Capacitance retention *versus* the cycle number for EDC-3, measured at 10 A g^{-1} and 20 ^{o}C.

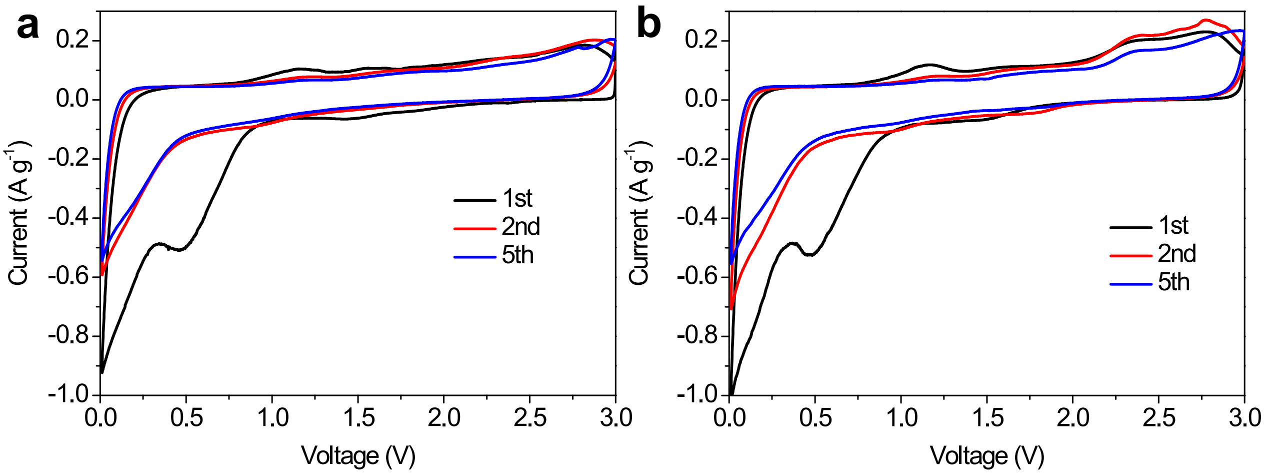

Fig. S9 (a) CV curves of EDC-1 at 0.1 mV s^{-1}. (b) CV curves of EDC-2 at 0.1 mV s^{-1}.

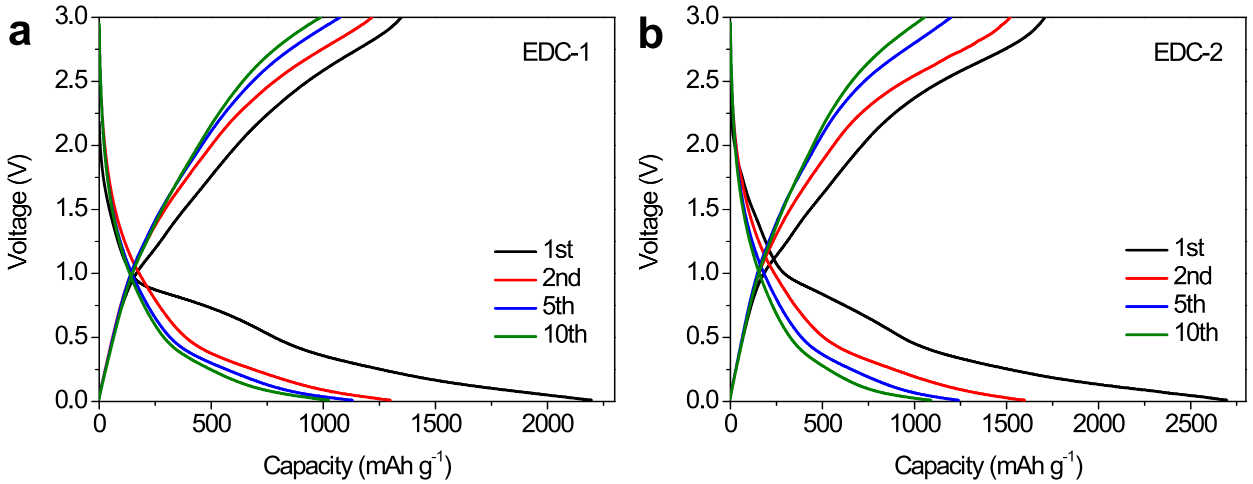

Fig. S10 Charge-discharge curves of (a) EDC-1 and (b) EDC-2 at 0.1 A g^{-1}.

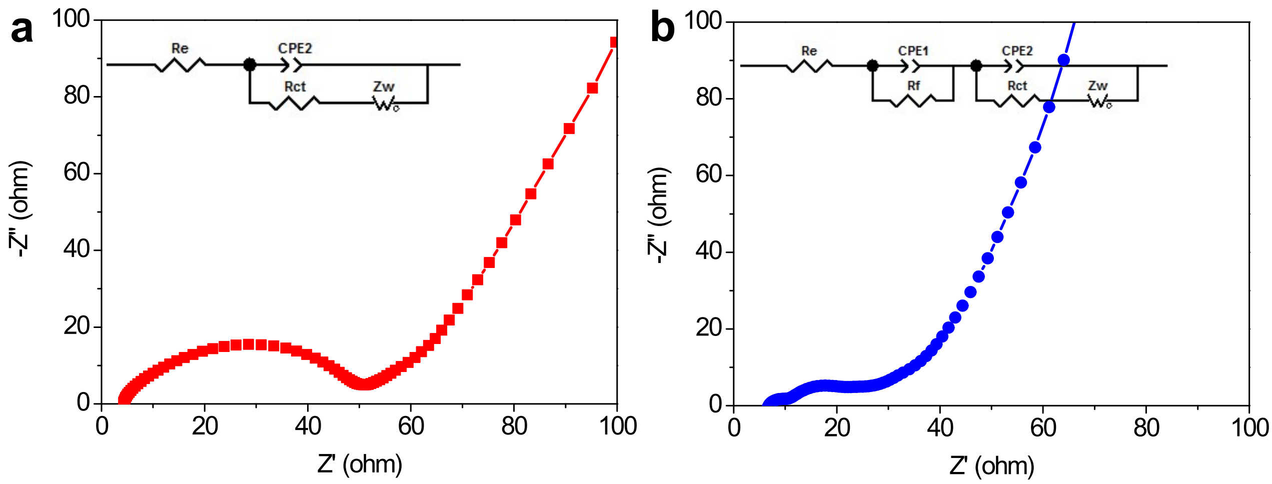

Fig. S11 Nyquist plots of the EDC-3 electrode (a) before cycling and (b) after 500 cycles. Inset is the used equivalent circuit.

Table S3 Comparison of capacity of carbon-based electrodes for lithium ion battery.

Sample	Electrolyte	Voltage	Initial coulombic efficiency	Rate capacity	Cyclability
Carbon nanobubbles[18]	1M $LiPF_6$	0-3V	50%	1394 mAh g^{-1} at 1A g^{-1}; 622 mAh g^{-1} at 5 A g^{-1}; 498 mAh g^{-1} at 10 A g^{-1};	~100 % capacity retention at 100 cycle and 10 A g^{-1}
Hierarchically porous nitrogen-rich carbon[19]	$LiPF_6$	0-3V	64%	1470 mAh g^{-1} at 0.037 A g^{-1}; 975 mAh g^{-1} at 0.37 A g^{-1}; 344 mAh g^{-1} at 18.5 A g^{-1}; 198 mAh g^{-1} at 37 A g^{-1};	976 mAh g^{-1} at 300 cycle and 0.37 A g^{-1}; 659 mAh g^{-1} at 300 cycle and 3.7 A g^{-1}
Nitrogen-doped porous carbon[20]	1 M $LiPF_6$	0.01-3V	58.4%.	2163 mAh g^{-1} at 100 mA g^{-1}; 1790 mAh g^{-1}at 200 mA g^{-1}; 1588 mAh g^{-1} at 400 mA g^{-1}; 1463 mAh g^{-1} at 600 mA g^{-1}; 1361 mAh g^{-1} at 800 mA g^{-1}; 1182 mAh g^{-1} at1600 mA g^{-1};	785 mAh g^{-1} after 1000 cycles and 5 A g^{-1}; 2132 mAh g^{-1} after 50 cycles and 0.1 Ag^{-1} (99.2% capacity retention)
Porous graphene[21]	1M $LiPF_6$	0.01-3V	52%	860 mAh g^{-1} at 0.5 A g^{-1}; 560 mAh g^{-1} at 5 A g^{-1} ; 220 mAh g^{-1} at 80 A g^{-1};	470 mAh g^{-1} after 2000 cycles and 10 A g^{-1}
Hybrid carbon naotube and graphene nanostructures[22]	1M $LiPF_6$	0.01-3V	～54%	900 mAh g^{-1} at 100 mA g^{-1}; 526 mAh g^{-1} at 900 mA g^{-1}; 370 mAh g^{-1} at 1500 mAg^{-1};	98.92% after 250 cycles and 600 mA g^{-1}
Amorphous carbon nanotubes with hollow graphitic carbon nanospheres[23]	1M $LiPF_6$	0-3V	55.9%	960 mAh g^{-1} at 0.05 A g^{-1}; 748 mAh g^{-1} at 0.1 A g^{-1}; 573 mAh g^{-1} at 0.25 A g^{-1}; 456 mAh g^{-1} at 0.5 A g^{-1}; 400 mAh g^{-1} at 1.85 A g^{-1}; 330 mA h g^{-1} at 3.7 A g^{-1};	965 mA h g^{-1} after 100 cycles and 0.05A g^{-1}; 330 mA h g^{-1} after 650 cycles and 3.7 A g^{-1};
Hollow carbon nanotube/carbon nanofiber hybrid anodes2[4]	1M $LiPF_6$	0-3V	62.2%	940 mAh g^{-1} at 0.5 A g^{-1}; 700 mAh g^{-1} at 1 A g^{-1}; 500 mAh g^{-1} at 3 A g^{-1}; 380 mAh g^{-1} at 5 A g^{-1}; 320 mAh g^{-1} at 8 A g^{-1};	1150 mAh g^{-1} after 70 cycles and 0.1 A g^{-1} ; 320 mAh g^{-1} after 3500 cycles and 8 A g^{-1} (> 80% capacity retention)

Folded structured graphene paper[25]	1 M $LiPF_6$	0.01–3.5 V	79.2%	557 mAh g^{-1} at 0.2 A g^{-1}; 268 mAh g^{-1} at 0.5A g^{-1}; 169 mAh g^{-1} at 1 A g^{-1}; 141mAh g^{-1} at 1.5A g^{-1};	-
Nitrogen-doped porous carbon nanofiber webs[26]	1 M $LiPF_6$	0.01–3 V	48.4%	924 mAh g^{-1} at 0.5 A g^{-1}; 773 mAh g^{-1} at 1 A g^{-1}; 637 mAh g^{-1} at 2 A g^{-1}; 505 mAh g^{-1} at 5 A g^{-1}; 321 mAh g^{-1} at 10 A g^{-1};	943 mAh g^{-1} after 600 cycles and 2 A g^{-1}
Two-dimensional mesoporous carbon nanosheets[27]	1 M $LiPF_6$	0.01-3V	< 30%	770 mAh g^{-1} at 0.1 A g^{-1}; 540 mAh g^{-1} at 0.2 A g^{-1}; 430 mAh g^{-1} at 0.5 A g^{-1}; 370 mAh g^{-1} at 1 A g^{-1}; 255 mAh g^{-1} at 5 A g^{-1};	-
Branched graphene nanocapsules[28]	1 M $LiPF_6$	0.01-3V	66.2%	1340 mAh g^{-1} at 0.4 A g^{-1}; 750 mAh g^{-1} at 8 A g^{-1}; 447 mAh g^{-1} at 20 A g^{-1};	1373 mAh g^{-1} after 200 cycles and 0.5A g^{-1}; 604 mAh g^{-1} after 5000 cycles and 15 A g^{-1};
Mesoporous nitrogen-rich carbons derived from protein[29]	1 M $LiPF_6$	0.01-3V	55-65%	865 mAh g^{-1} at 0.3 A g^{-1}; 460 mAh g^{-1} at 1 A g^{-1}; 205 mAh g^{-1} at 4 A g^{-1};	70% after 100 cycles and 0.5 A g^{-1}
Carbon nanorings[30]	1 M $LiPF_6$	0.01-3V	62.1%	1216 mAh g^{-1} at 1 A g^{-1}; 939 mAh g^{-1} at 4.8 A g^{-1}; 758 mAh g^{-1} at 15 A g^{-1}; 508 mAh g^{-1} at 45 A g^{-1};	1263 mAh g^{-1} after 100 cycles and 0.4 A g^{-1}
Nitrogen-doped carbon capsules[31]	1 M $LiPF_6$	0.01-3V	90.2%	920 mAh g^{-1} at 0.1 A g^{-1}; 285 mAh g^{-1} at 20 A g^{-1};	1046 mAh g^{-1} after 50 cycles and 50 mA g^{-1}; 750 mAh g^{-1} after 600 cycles and 2 A g^{-1};
Sulfur-doped porous carbons hybridized with graphene[32]	1 M $LiPF_6$	0.01-3 V	55.6%	1400 mAh g^{-1} at 0.05 A g^{-1}; 280 mAh g^{-1} at 20 A g^{-1};	780 mAh g^{-1} after 500 cycles and 1A g^{-1}
Nitrogen and sulfur codoped graphene[33]	1 M $LiPF_6$	0.005-3V	44.7%	896 mAh g^{-1} at 0.4 A g^{-1}; 882 mAh g^{-1} at 0.8A g^{-1}; 844 mAh g^{-1} at 2 A g^{-1}; 297 mAh g^{-1} at 5 A g^{-1};	1090 mAh g^{-1} after 500 cycles and 0.2A g^{-1}
Porous carbon nanofiber[34]	1 M $LiPF_6$	0.001-3V	~54-55%	1950 mAh g^{-1} at 0.1 A g^{-1}; 1000 mAh g^{-1} at 0.5 A g^{-1}; 723 mAh g^{-1} at 1 A g^{-1}; 357 mAh g^{-1} at 5 A g^{-1};	178 0mAh g^{-1} after 40 cycles and 50 mA g^{-1}; 1500mAh g^{-1} after 600 cycles and 500 mA g^{-1};

				272 mAh g^{-1} at 10 A g^{-1}; 200 mAh g^{-1} at 20 A g^{-1};	
Porous carbon nanofiber webs[35]	1 M $LiPF_6$	0.01-3V	56%	1068 mAh g^{-1} at 0.1 A g^{-1}; 505 mAh g^{-1} at 1 A g^{-1}; 436 mAh g^{-1} at 2 A g^{-1}; 261 mAh g^{-1} at 8 A g^{-1}; 250 mAh g^{-1} at 10 A g^{-1};	857.6 mAh g^{-1} after 100 cycles and 0.1A g^{-1}
3D carbon nanotubes[36]	1 M $LiPF_6$	0.01-3V	-	312 mAh g^{-1} at 0.2 C ; 251 mAh g^{-1} at 0.5 C; 211 mAh g^{-1} at 1 C; 155 mAh g^{-1} at 3 C; (1 C= 372 mAh g^{-1})	211-264 mAh g^{-1} after 50 cycles and 0.5 C
3D hierarchical porous graphene[37]	1 M $LiPF_6$	0.1-3V	42%	1050 mAh g^{-1} at 0.1 A g^{-1}; 750 mA h g^{-1} at 0.5 A g^{-1}; 500 mAh g^{-1} at 2 A g^{-1}; 400 mAh g^{-1} at 10 A g^{-1}; 300 mAh g^{-1} at 20 A g^{-1};	700-1100 mAh g^{-1} after 100 cycles and 0.1A g^{-1}
Sulfur-doped mesoporous carbon[38]	1 M $LiPF_6$	0.01-3V	-	1042 mAh g^{-1} at 0.1 A g^{-1}; 675 mA h g^{-1} at 0.2 A g^{-1}; 583 mAh g^{-1} at 0.5 A g^{-1}; 441 mAh g^{-1} at 1 A g^{-1}; 322 mAh g^{-1} at 2 A g^{-1};	579 mAh g^{-1} after 970 cycles and 0.5 A g^{-1}
Nitrogen-doped 3D macroporous graphene frameworks[39]	1 M $LiPF_6$	0.005-3V	49%	750 mAh g^{-1} at 0.5 A g^{-1}; 480 mAh g^{-1} at 2 A g^{-1};	1094 mAh g^{-1} after 100 cycles and 0.2 A g^{-1}; 691 mAh g^{-1} after 500 cycles and 1A g^{-1};
EDCs (this work)	1 M $LiPF_6$	0.01-3V	61-64%	900-1000 mAh g^{-1} at 0.1 A g^{-1}; 650 mA h g^{-1} at 0.5 A g^{-1}; 220 mAh g^{-1} at 5 A g^{-1}; 170 mAh g^{-1} at 10 A g^{-1};	350 mAh g^{-1} after 500 cycles and 2 A g^{-1}

References

1. A. Vu, X. Y. Li, J. Phillips, A. J. Han, W. H. Smyrl, P. Buhlmann and A. Stein, *Chem. Mater.*, 2013, **25**, 4137-4148.
2. J. H. Hou, C. B. Cao, X. L. Ma, F. Idrees, B. Xu, X. Hao and W. Lin, *Sci. Rep.*, 2014, **4**, 7260.
3. H. L. Wang, Z. Li, J. K. Tak, C. M. B. Holt, X. H. Tan, Z. W. Xu, B. S. Amirkhiz, D. Hayfield, A. Anyia, T. Stephenson and D. Mitlin, *Carbon*, 2013, **57**, 317-328.
4. J. H. Hou, C. B. Cao, F. Idrees and X. L. Ma, *ACS Nano*, 2015, **9**, 2556-2564.
5. H. Wang, Z. W. Xu, A. Kohandehghan, Z. Li, K. Cui, X. H. Tan, T. J. Stephenson, C. K. King'ondu, C. M. B. Holt, B. C. Olsen, J. K. Tak, D. Harfield, A. O. Anyia and D. Mitlin, *ACS Nano*, 2013, **7**, 5131-5141.
6. Y. S. Yun, S. Y. Cho, J. Shim, B. H. Kim, S. J. Chang, S. J. Baek, Y. S. Huh, Y. Tak, Y. W. Park, S. Park and H. J. Jin, *Adv. Mater.*, 2013, **25**, 1993-1998.
7. H. T. Zhang, X. Zhang, X. Z. Sun and Y. W. Ma, *Sci. Rep.*, 2013, **3**, 3534.
8. B. E. Wilson, S. Y. He, K. Buffington, S. Rudisill, W. H. Smyrl and A. Stein, *J. Power Sources*, 2015, **298**, 193-202.
9. W. Chen, R. B. Rakhi, M. N. Hedhili and H. N. Alshareef, *J. Mater. Chem. A*, 2014, **2**, 5236-5243.
10. T. Kim, G. Jung, S. Yoo, K. S. Suh and R. S. Ruoff, *ACS Nano*, 2013, **7**, 6899-6905.
11. L. Zhang, F. Zhang, X. Yang, G. K. Long, Y. P. Wu, T. F. Zhang, K. Leng, Y. Huang, Y. F. Ma, A. Yu and Y. S. Chen, *Sci. Rep.*, 2013, **3**, 1408.
12. N. Jha, P. Ramesh, E. Bekyarova, M. E. Itkis and R. C. Haddon, *Adv. Energy Mater.*, 2012, **2**, 438-444.
13. Q. G. Shao, J. Tang, Y. X. Lin, J. Li, F. X. Qin, J. S. Yuan and L. C. Qin, *J. Power Sources*, 2015, **278**, 751-759.
14. D. T. Pham, T. H. Lee, D. H. Luong, F. Yao, A. Ghosh, V. T. Le, T. H. Kim, B. Li, J. Chang and Y. H. Lee, *ACS Nano*, 2015, **9**, 2018-2027.
15. X. Y. Chen, D. H. Xie, Z. J. Zhang and C. Chen, *J. Power Sources*, 2014, **246**, 531-539.
16. W. Q. Tian, Q. M. Gao, Y. L. Tan, K. Yang, L. H. Zhu, C. X. Yang and H. Zhang, *J. Mater. Chem. A*, 2015, **3**, 5656-5664.
17. A. B. Fuertes and M. Sevilla, *Carbon*, 2015, **94**, 41-52.
18. H. W. Song, N. Li, H. Cui and C. X. Wang, *Nano Energy*, 2014, **4**, 81-87.
19. L. Chen, Y. Z. Zhang, C. H. Lin, W. Yang, Y. Meng, Y. Guo, M. L. Li and D. Xiao, *J. Mater. Chem. A*, 2014, **2**, 9684-9690.
20. F. C. Zheng, Y. Yang and Q. W. Chen, *Nat. Commun.*, 2014, **5**, 5261.
21. Z. L. Wang, D. Xu, H. G. Wang, Z. Wu and X. B. Zhang, *ACS Nano*, 2013, **7**, 2422-2430.
22. W. Wang, I. Ruiz, S. R. Guo, Z. Favors, H. H. Bay, M. Ozkan and C. S. Ozkan, *Nano Energy*, 2014, **3**, 113-118.
23. Y. M. Chen, Z. G. Lu, L. M. Zhou, Y. W. Mai and H. T. Huang, *Energy Environ. Sci.*, 2012, **5**, 7898-7902.

24. Y. M. Chen, X. Y. Li, K. Park, J. Song, J. H. Hong, L. M. Zhou, Y. W. Mai, H. T. Huang and J. B. Goodenough, *J. Am. Chem. Soc.*, 2013, **135**, 16280-16283.
25. F. Liu, S. Y. Song, D. F. Xue and H. J. Zhang, *Adv. Mater.*, 2012, **24**, 1089-1094.
26. L. Qie, W. M. Chen, Z. H. Wang, Q. G. Shao, X. Li, L. X. Yuan, X. L. Hu, W. X. Zhang and Y. H. Huang, *Adv. Mater.*, 2012, **24**, 2047-2050.
27. Y. Fang, Y. Y. Lv, R. C. Che, H. Y. Wu, X. H. Zhang, D. Gu, G. F. Zheng and D. Y. Zhao, *J. Am. Chem. Soc.*, 2013, **135**, 1524-1530.
28. Y. P. Liu, W. Li, D. K. Shen, C. Wang, X. M. Li, M. Pal, R. Y. Zhang, L. Chen, C. Yao, Y. Wei, Y. H. Li, Y. J. Zhao, H. W. Zhu, W. X. Wang, A. M. El-Toni, F. Zhang and D. Y. Zhao, *Chem. Mater.*, 2015, **27**, 5577-5586.
29. Z. Li, Z. W. Xu, X. H. Tan, H. L. Wang, C. M. B. Holt, T. Stephenson, B. C. Olsen and D. Mitlin, *Energy Environ. Sci.*, 2013, **6**, 871-878.
30. J. Sun, H. M. Liu, X. Chen, D. G. Evans, W. S. Yang and X. Duan, *Adv. Mater.*, 2013, **25**, 1125-1130.
31. C. G. Hu, Y. Xiao, Y. Zhao, N. Chen, Z. P. Zhang, M. H. Cao and L. T. Qu, *Nanoscale*, 2013, **5**, 2726-2733.
32. Y. Yan, Y. X. Yin, S. Xin, Y. G. Guo and L. J. Wan, *Chem. Commun.*, 2012, **48**, 10663-10665.
33. W. Ai, Z. M. Luo, J. Jiang, J. H. Zhu, Z. Z. Du, Z. X. Fan, L. H. Xie, H. Zhang, W. Huang and T. Yu, *Adv. Mater.*, 2014, **26**, 6186-6192.
34. W. H. Li, M. S. Li, M. Wang, L. C. Zeng and Y. Yu, *Nano Energy*, 2015, **13**, 693-701.
35. W. Wang, Y. Sun, B. Liu, S. G. Wang and M. H. Cao, *Carbon*, 2015, **91**, 56-65.
36. C. W. Kang, M. Patel, B. Rangasamy, K. N. Jung, C. L. Xia, S. Shi and W. Choi, *J. Power Sources*, 2015, **299**, 465-471.
37. L. Ren, K. N. Hui, K. S. Hui, Y. D. Liu, X. Qi, J. X. Zhong, Y. Du and J. P. Yang, *Sci. Rep.*, 2015, **5**, 14229.
38. S. L. Zhang, F. Yao, L. Yang, F. Z. Zhang and S. L. Xu, *Carbon*, 2015, **93**, 143-150.
39. X. W. Liu, Y. Wu, Z. Z. Yang, F. S. Pan, X. W. Zhong, J. Q. Wang, L. Gu and Y. Yu, *J. Power Sources*, 2015, **293**, 799-805.