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Enhanced storage capability by biomass-derived porous carbon for lithium-ion and sodium-ion batteries anodes

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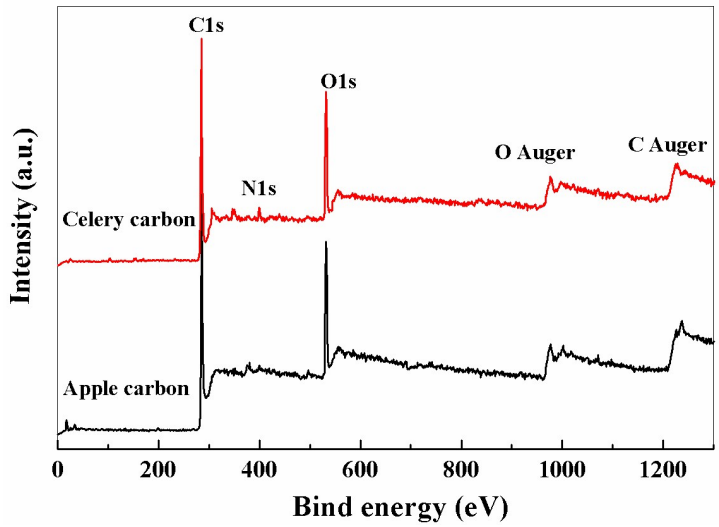

Fig. S1 XPS survey spectrum of as-prepared porous carbon.

Table S1 Elemental analysis and contents of the as-prepared samples from XPS spectrum.

Sample	**C (at%)**	**O (at%)**	**N (at%)**
Apple carbon	83.42	13.96	2.62
Celery carbon	79.98	14.94	5.08

Table S2 Contents of N the as-prepared samples from XPS spectrum N1s peak.

Sample	**Peak area pyridinic N**	**Peak area pyridonic N**	**Peak area quaternary N**
Apple carbon	814.7	1776.3	81.7
Celery carbon	2230.0	2085.7	890.5

Table S3. The comparison of electrochemical performance of porous carbon materials for LIBs and SIBs.

Carbon	**Battery species**	**Cycling performance (mAh g^{-1})**	**Rate capability (mAh g^{-1})**	**Initial Coulomb efficiency (%)**
Soybean carbon[1]	LIBs	360 after 100 cycles at 0.18 A g^{-1} (0.5C)	310 at 2 C, 275 at 4 C	~88
Wheat straw carbon[2]	LIBs	1327 after 50 cycles at 0.037 A g^{-1}	1129 at 0.185 A g^{-1}, 975 at 0.37 A g^{-1},731 at 1.85 A g^{-1} and 664 at 3.7 A g^{-1}	64
Sisal fibers carbon[3]	LIBs	~250 after 30 cycles at 0.1C		43
Chitosan biomass carbon[4]	LIBs	460 after 1100 cycles at 0.5 A g^{-1}	460.7 at 0.05 A g^{-1}, 421.9 at 0.1 A g^{-1}, 353 at 0.2 A g^{-1}, 298.5 at 0.5 A g^{-1}, 227.8 at 1 A g^{-1}, 180.5 at 2 A g^{-1}, 134.3 at 5 A g^{-1}	~90
Pomelo peels carbon[5]	SIBs	181 after220 cycles at 200m A g^{-1}	71 at 5 A g^{-1}	27
viz. ox horn carbon[6]	SIBs	255 after 300 cycles at 100m A g^{-1}	117 at 5 A g^{-1}	~35
Sandwich-Like Hierarchically Porous Carbon/ Graphene Composite[7]	SIBs	500 after100 cycles at 50m A g^{-1}	250 at 1 A g^{-1}	~40
Graphene-based nitrogen-doped carbon sandwich nanosheets[8]	SIBs	154 after 10000 cycles at 5000m A g^{-1}	110 at 10000 mA g^{-1}	~40
honey	LIBs	722 after 200 cycles at 1 A g^{-1}	390 at 5 A g^{-1}	65

carbon[9]	SIBs	394 after 100 cycles at 100 mA g^{-1}	394 at 0.1 A g^{-1}, 370 at 0.2 A g^{-1}, 346 at 0.3 A g^{-1}, 313 at 0.4 A g^{-1}, 281 at 0.5 A g^{-1} and 217 at 1 A g^{-1}	~40
pores-and hetero-atoms-riched carbon nanobubbles[10]	LIBs	1317 after 50 cycles at 1A g^{-1}	1394 at 1 A g^{-1} ,903 at 2 A g^{-1}, 622 at A g^{-1}, 498 at 10 A g^{-1}, and 200 at 20 A g^{-1}	~50
	SIBs	~120 after 30 cycles at 100 mA g^{-1}	175 at 50 mA g^{-1}, 120 at 100 mA g^{-1}, 75 at 200 mA g^{-1}, and 25 at 500 mA g^{-1}.	
water hyacinths carbon[11]	LIBs	740 after 100 cycles at 50 mA g^{-1}	747 at 0.05 A g^{-1}, 625 at 0.1 A g^{-1}, 543 at 0.2 A g^{-1}, 475 at 0.4 A g^{-1}, 410 at 0.8 A g^{-1} and 348 at 1.6 A g^{-1}	~69
	SIBs	293 after 100 cycles at 50 mA g^{-1}	248 at 0.05 A g^{-1} , 217 at 0.1 A g^{-1}, 193 at 0.1 A g^{-1}, 166 at 0.4 A g^{-1} , 141 at 0.8 A g^{-1} and 120 at 1.6 A g^{-1}	~48
graphene-like nanosheets on porous carbon framework[12]	LIBs	681after 100 cycles at 0.1 A g^{-1}	243 at 5 A g^{-1}	~50
	SIBs	233 after450 cycles at 0.5 A g^{-1}	302 at 0.1 A g^{-1}, 250 at 0.2 A g^{-1}, 221 at 0.5 A g^{-1}, 175 at 1 A g^{-1}, 130 at 2 A g^{-1}, 108 at 5 A g^{-1} , and 87 at 10 A g^{-1}	
Nitrogen and sulfur dual-doped carbon films[13]	LIBs	880 after700 cycles at 100mA g^{-1}	357 at 2 A g^{-1}	~60
	SIBs	520 after 400 cycles at 100mA g^{-1}	155 at 2 A g^{-1}	~50
Orange peel activated hard carbon[14]	LIBs	301 after 100 cycles at 0.5 A g^{-1}	335 at 1 A g^{-1}	~46
	SIBs	156 after 100 cycles at 0.5 A g^{-1}	125 at 1 A g^{-1}	~30
Hierarchical porous nitrogen-rich carbon nanospheres[15]	LIBs	1187 after 100 cycles at 100 mA g^{-1}	470 at 5000 mA g^{-1}	57
	SIBs	136 after 500 cycles at 1000 mA g^{-1}	357 at 100 mA g^{-1} 148 at 1000 mA g^{-1}	60
Apple carbon in this work	LIBs	1050 after 200 cycles at 0.1 A g^{-1}	1000 at 1.11 A g^{-1}, 620 at 1.85 A g^{-1}, 400 at 3.7 A	73

			g^{-1},and 200 at 7.4 A g^{-1}	
	SIBs	438 after 200 cycles at 50 mA g^{-1}	321 at 0.2A g^{-1}, 285 at 0.3 A g^{-1}, 230 at 0.5A g^{-1}, 175 at 1 A g^{-1} and 116 at 2A g^{-1}	53
Celery carbon in this work	LIBs	990 after 200 cycles at 0.1 A g^{-1}	850 at 1.11 A g^{-1}, 700 at 1.85 A g^{-1}, 540 at 3.7 A g^{-1}, and 300 at 7.4 A g^{-1}	62
	SIBs	451 after 200 cycles at 50 mA g^{-1}	390 at 0.2 A g^{-1}, 330, at 0.3 A g^{-1}, 240 at 0.5 A g^{-1}, 195 at 1 A g^{-1} and 162 at 2 A g^{-1}.	63

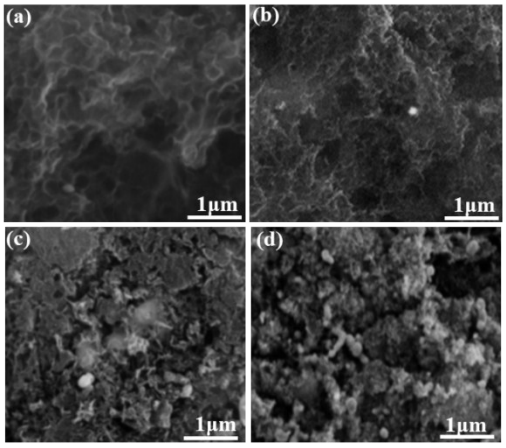

Fig. S2 SEM images of as-samples after 200th cycle for LIBs and SIBs of apple carbon (a, b) and celery carbon (c, d).

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