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

Supplementary Information

Hierarchically porous nitrogen-rich carbon derived from wheat straw as an ultrahigh-rate anode for lithium ion battery

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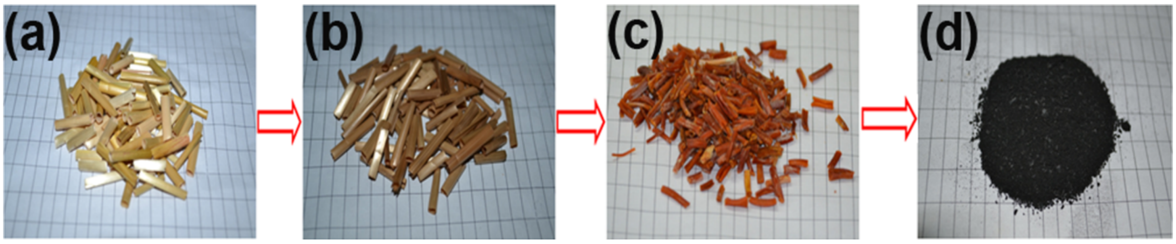

Fig. S1 Illustration of the fabrication processes HPNC: (a) wheat straw; (b) wheat straw after acid pretreatment; (c) material of (b) immersed in KOH solution for 24h; (d) HPNC.

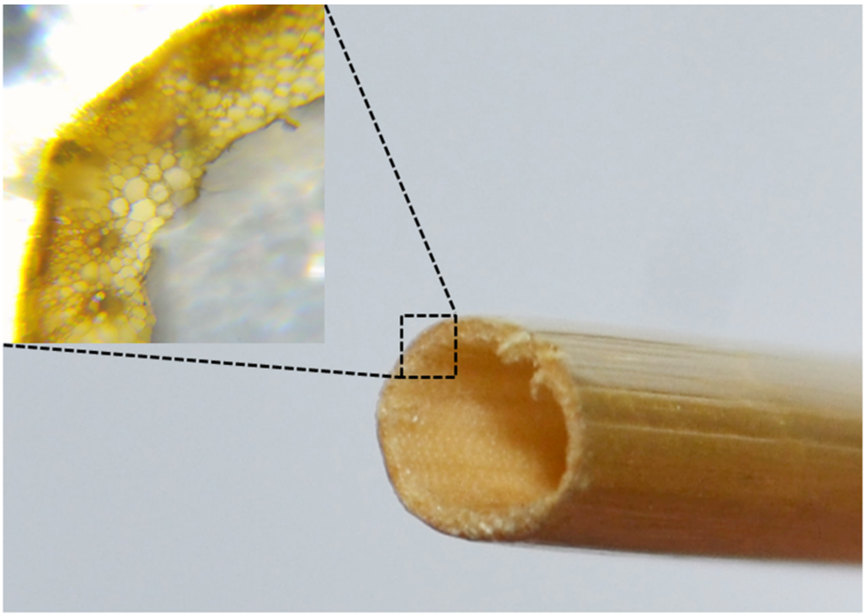

Fig. S2 The cross-section image and drawing of partial enlargement of wheat straw.

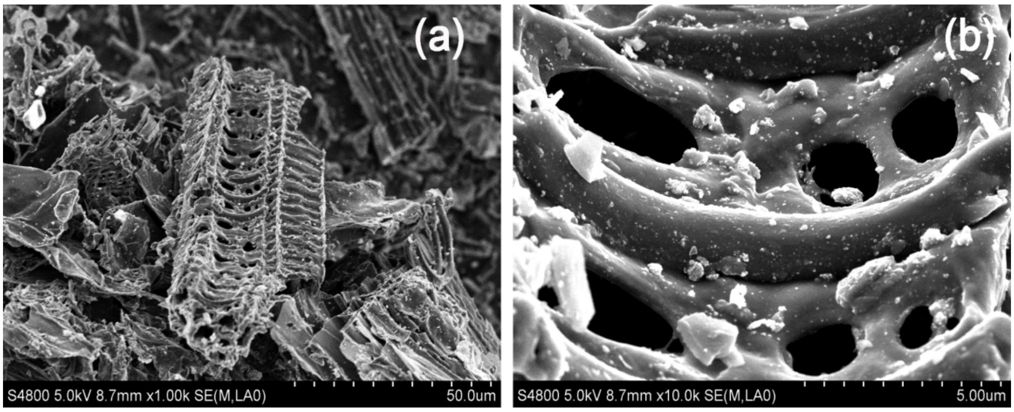

Fig. S3 SEM images of carbonized wheat straw after reflux with HCl solution. (b) is partial enlargement of (a).

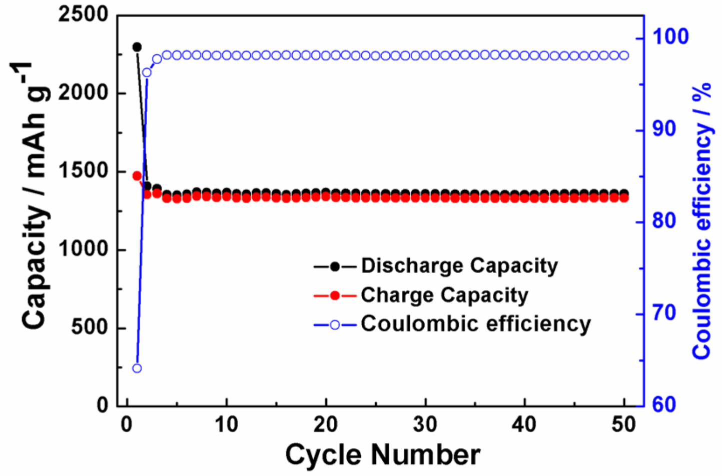

Fig. S4 Cyclability and Coulombic efficiency of HPNC at 0.037 A g^{-1}.

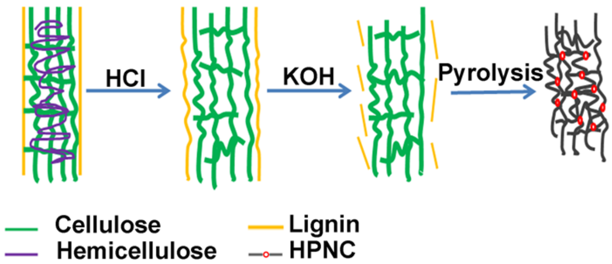

Fig. S5 Schematic of the roles of each step in the conversion from wheat straw to HPNC.

Table S1 Comparison of the performances of lithium ion batteries used HPNC and those of some other typically carbon materials derived from biomass as anodes.

Sample	carbon source	Mass loading (mg cm^{-2})	Initial reversible capacity (mAh g^{-1})	Rate capability (mAh g^{-1})	Ref.
HPNC	Wheat straw	~8	1470 at 37 mA g^{-1}	344 at 18.5 A g^{-1} 198 at 37 A g^{-1}	this work
Heteroatom-enriched amorphous carbon with hierarchical porous structure(HAC-HPS)	Cotton cellulose	-	935 at 50 mA g^{-1}	240 at 2 A g^{-1}	[S1]
Rice husk-derived carbon	Rice husk	-	393 at 75 mA g^{-1}	137 at 3.75 A g^{-1}	[S2]
Hierarchical porous carbons	Rice straws	-	986 at 0.1 C	257 at 2 C	[S3]
Protein derived mesoporous carbon (PMC)	Egg white	1	1780 at 100 mA g^{-1}	205 at 4 A g^{-1}	[S4]
Microstructure of mangrove-charcoal-derived carbon (MC)	Mangrove charcoal	-	524 at 3 mA g^{-1}	440 at 0.3 A g^{-1}	[S5]
New carbonaceous material	Spongy pomelo peels	-	450 at 40 mA g^{-1}	293 at 0.32 A g^{-1}	[S6]
Disordered carbons	Cherry stones	3	~ 600 at 0.1 C	200 at 5 C	[S7]
Porous carbon spheres	Porous starch	-	614	-	[S8]
Pyrolytic carbon	Sorona	-	615 at 0.1 C	-	[S9]
Pyrolyzed sugar carbons (PSCs)	Local sugar	-	476 at 0.1 C	-	[S10]
High capacity disordered carbons	Coconut shells	-	~ 600	-	[S11]
Microporous carbon	Pinecone hull	-	321 at 10 mA g^{-1}	-	[S12]
Disordered carbonaceous materials	Coffee shells	-	456 at 0.2 C	-	[S13]
High-capacity disordered carbons	Peanut shells	-	1650 at 0.1 C	-	[S14]
Disordered carbonaceous materials	Banana fibers	-	401 at 0.1 C	-	[S15]
Carbonaceous materials	Sugarcane bagasse	1.8-6	310 at 105 mA g^{-1}	-	[S16]

Table S2 Energy Dispersive Spectrometer results.

	C%	O%	Si%	Cl%	K%	Zn%
NWS	78.99	14.10	2.77	0.60	2.73	0.81
AWS	76.10	22.08	0.47			1.35
HPNC	77.10	22.90				

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