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Nitrogen-rich porous carbon derived from biomass as a high performance anode material for lithium ion batteries

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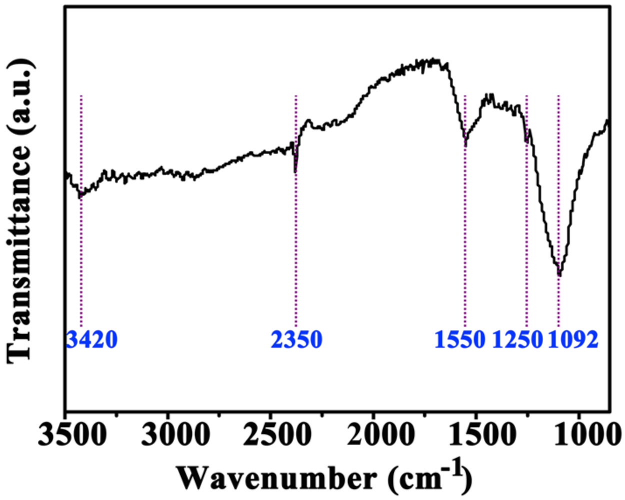

Fig. S1 FTIR spectra of as-fabricated OHC.

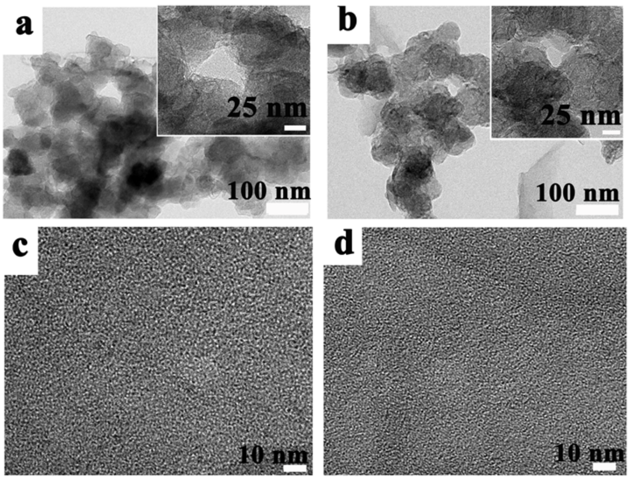

Fig. S2 TEM images of the electrode of the OHC before (a, c) and after (b, d) 20 cycles at a current density of 0.1 A g^{-1} in the range 0.01-3 V, The insets of (a) and (b) are the partial enlargements of the relevant images.

Table S1. Elemental analysis of NOHC and OHC.

Sample	Chemical	composition[wt%]		
	C	N	O	H
NOHC	83.7	6.7	5.3	4.3
OHC	85.0	5.4	6.1	3.5

Table S2. Comparison of the performances of lithium ion batteries used OHC and those of some other typically carbon materials derived from biomass as anodes.

Sample	Carbon sources	Initial reversible capacity (mA h g^{-1})	Rate capability (mA h g^{-1})	Ref.
OHC	Ox horn	1290 at 0.1 A g^{-1}	304 at 5 A g^{-1}	This work
Rice husk-derived carbon	Rice husk	393 at 0.075 A g^{-1}	137 at 3.75 A g^{-1}	[S1]
Heteroatom-enriched amorphous carbon with hierarchical porous structure(HAC-HPS)	Cotton cellulose	935 at 0.05 A g^{-1}	240 at 2 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	1780 at 0.1 A g^{-1}	205 at 4 A g^{-1}	[S4]
Microstructure of mangrove-charcoalderived carbon (MC)	Mangrove charcoal	524 at 0.003 A g^{-1}	440 at 0.3 A g^{-1}	[S5]
New carbonaceous material	Spongy pomelo peels	450 at 0.04 A g^{-1}	293 at 0.32 A g^{-1}	[S6]
Disordered carbons	Cherry stones	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 0.01 A 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	310 at 0.105 A g^{-1}	-	[S16]

References

[S1] L. P. Wang, Z. Schnepp and M. M. Titirici, *J. Mater. Chem. A,* 2013, **1,** 5269.
[S2] Y. S. Yun and H. J. Jin, *Mater. Lett.,* 2013, **108,** 311.
[S3] F. Zhang, K. X Wang, G. D. Li and J. S. Chen, *Electrochem. Commun.,* 2009, **11,** 130.
[S4] 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.
[S5] T. Liu, R. Y. Luo, W. M. Qiao, S. H. Yoon and I. Mochida, *Electrochim. Acta,* 2010, **55,** 1696.
[S6] X. L. Sun, X. H. Wang, N. Feng, L. Qiao, X. W. Li and D. Y. He, *J. Anal. Appl. Pyrol.,*2013, **100,** 181.
[S7] J. C. Arrebola, A. Caballero, L. Hernán, J. Morales, M. Olivares-Marín and V. Gómez- Serrano, *J. Electrochem. Soc.,* 2010, **157,** A791.
[S8] H. Q. Wang , Q. F. Dai, Q. Y. Li, J. H. Yang, X. X. Zhong, Y. G. Huang, A. Zhang and Z. X. Yan, *Solid State Ionics,* 2009, **180,** 1429.
[S9] M. Christy, M R Jisha, A. R. Kim, K. S. Nahm, D. J. Yoo and E. K. Suh, *Indian J. Eng. Mate. S.,* 2010, **17,** 343.
[S10] G. T. K. Fey and Y. C. Kao, *Mater. Chem. Phys.,* 2002, **73,** 37.
[S11] Y. J. Hwang, S. K. Jeong, J. S. Shin, K. S. Nahm and A. M. Stephan, *J. Alloy. Compd.,*2008, **448,** 141.
[S12] Y. Zhang, F. Zhang, G. D. Li and J. S. Chen, *Mater. Lett.,* 2007, **61,** 5209.
[S13] Y. J. Hwang, S. K. Jeong, K. S. Nahm, J. S. Shin and A. M. Stephan, *J. Phys. Chem. Solids,* 2007, **68,** 182.
[S14] G. T. K. Fey, D. C. Lee, Y. Y. Lin and T. P. Kumar, *Synthetic Met.,* 2003, **139,** 71.
[S15] A. M. Stephan, T. P. Kumar, R. Ramesh, S. Thomas, S. K. Jeong and K. S. Nahm, *Mater. Sci. Eng. A,* 2006, **430,** 132.
[S16] Y. Matsubara, S. M. Lala and J. M. Rosolen. *J. Braz. Chem. Soc.,* 2010, **21,** 1877.