Electronic Supplementary Material

Urea-assisted template-less synthesis of heavily nitrogen-doped hollow carbon fibers for the anode material of lithium-ion batteries

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Table S1. Microtextural parameters of conventional carbon nanofibers (CNF), hollow carbon nanofibers (HCF), and polyacrylonitrile nanofibers (PAN NFs) + urea (PU) heated at various temperatures .

	CNF	HCF	200℃	300℃	350℃	400℃
BET surface area [m^2 g^{-1}]	144.78	262.88	0.92	1.33	5.93	23.30
Total pore volume [cm^3 g^{-1}]	0.083	0.32	0.010	0.013	0.042	0.23
Mesopore surface area [m^2 g^{-1}]	6.95	40.33	–	–	–	–
Mesopore volume [cm^3 g^{-1}]	0.019	0.22	–	–	–	–
Micropore surface area [m^2 g^{-1}]	138.04	222.55	–	–	–	–
Micropore volume [cm^3 g^{-1}]	0.063 (76%)	0.097 (31%)	–	–	–	–

Table S2. Relative absorbance of the methylene blue solution after 24 h exposure to conventional carbon nanofibers (CNFs) and hollow carbon nanofibers (HCFs).

	CNF	HCF
Relative absorbance (%)	72.3%	13.3%

Table S3. Nitrogen content of conventional carbon nanofibers (CNFs) and hollow carbon nanofibers (HCFs)

Content (%)	Graphitic	Pyridinic	Pyrrolic	Molecular	Total Nitrogen
CNF	2.8	3.3	0.4	0.4	6.9
HCF	4.7	6.9	2.9	0.5	15.0

Table S4. Coulombic efficiency for the first three cycles at 0.1 C of (a) conventional carbon nanofiber (CNF)- and (b) hollow carbon nanofiber (HCF)-based anode

Coulombic Efficiency (%)	CNF	HCF
1 cycle	46.49	53.47
2 cycle	75.04	80.31
3 cycle	76.20	83.35

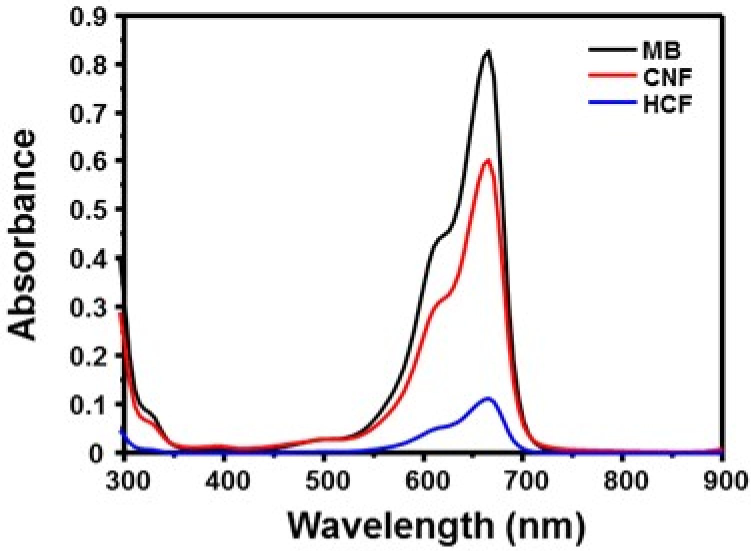

Figure S1. Ultraviolet-visible absorption spectra of the methylene blue (MB) solution before and after 24 h exposure to the conventional carbon nanofibers (CNF) and hollow carbon nanofibers (HCF) in the dark.

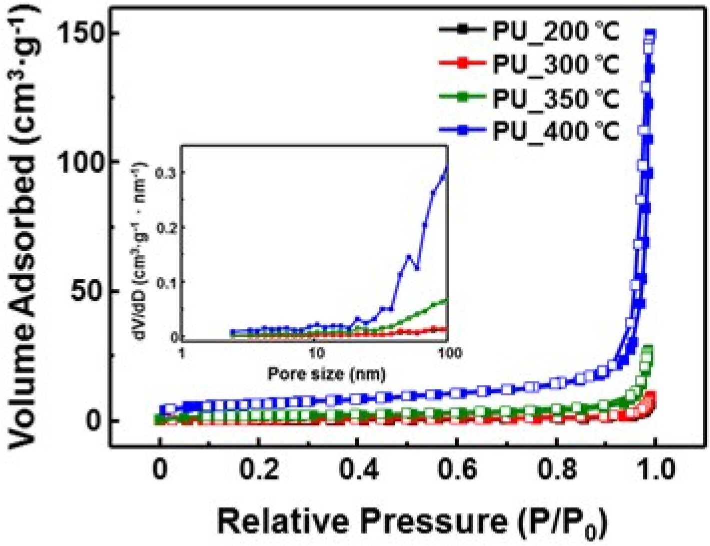

Figure S2. Nitrogen physisorption isotherms (insets: pore size distributions) of urea-coated polyacrylonitrile nanofibers heated at 200, 300, 350, and 400℃.

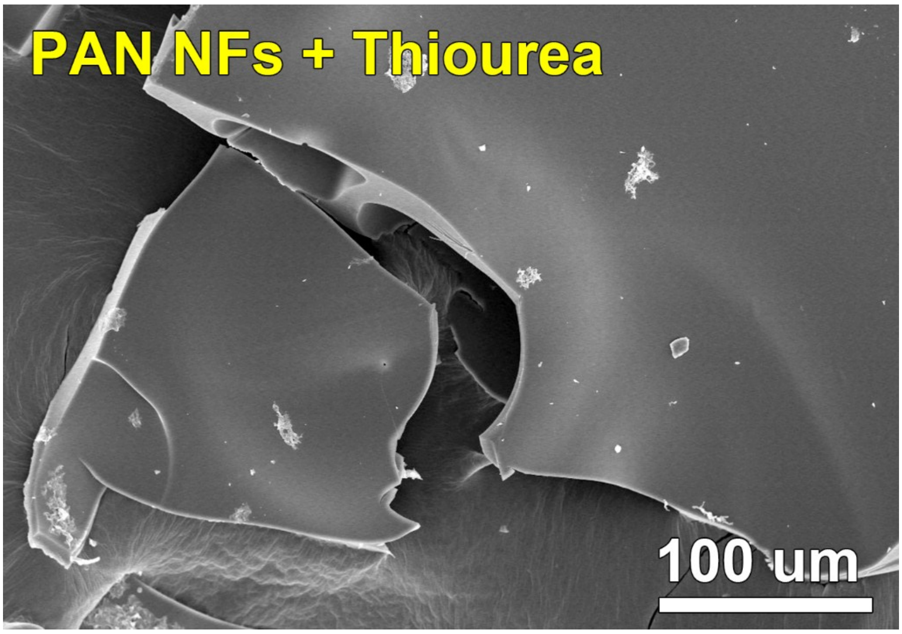

Figure S3. SEM image of thiourea coated PAN NFs under the same sintering condition of HCF fabrication.

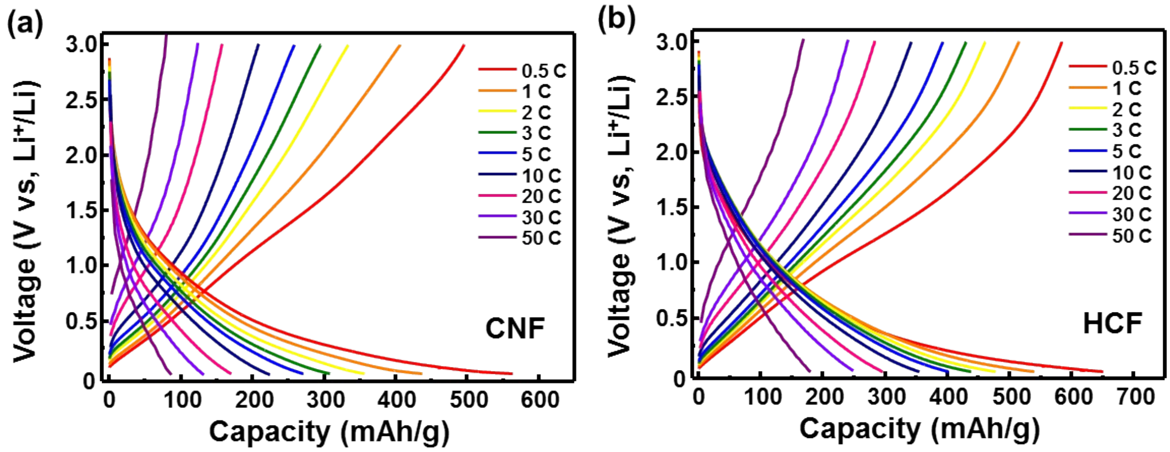

Figure S4. Galvanostatic charge–discharge profiles of (a) conventional carbon nanofiber (CNF)- and (b) hollow carbon nanofiber (HCF)-based anodes.

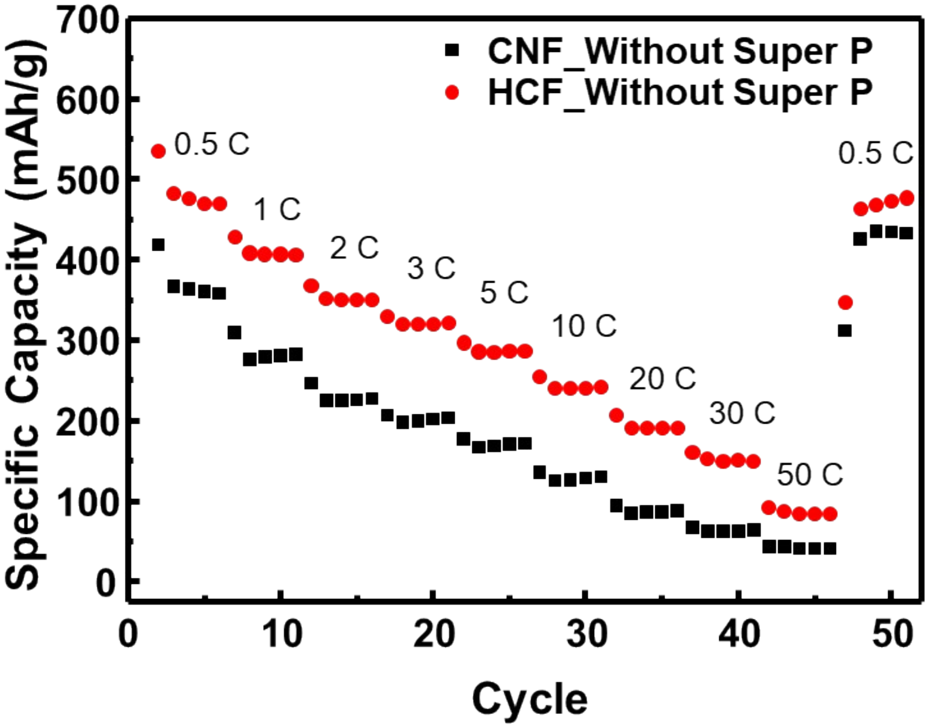

Figure S5. Electrochemical performance of (a) conventional carbon nanofiber (CNF)- and (b) hollow carbon nanofiber (HCF)-based anodes without conductivity agent (Super P).

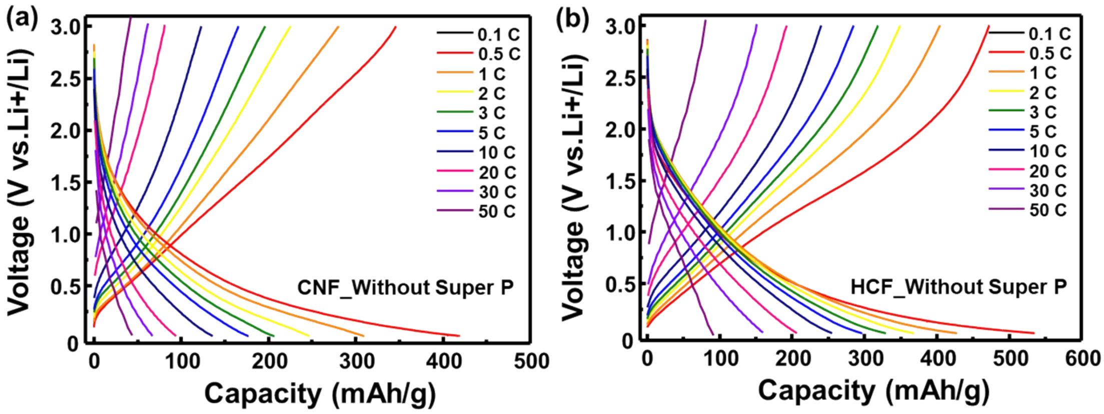

Figure S6. Galvanostatic charge–discharge profiles of (a) conventional carbon nanofiber (CNF)- and (b) hollow carbon nanofiber (HCF)-based anodes without conductivity agent (Super P).

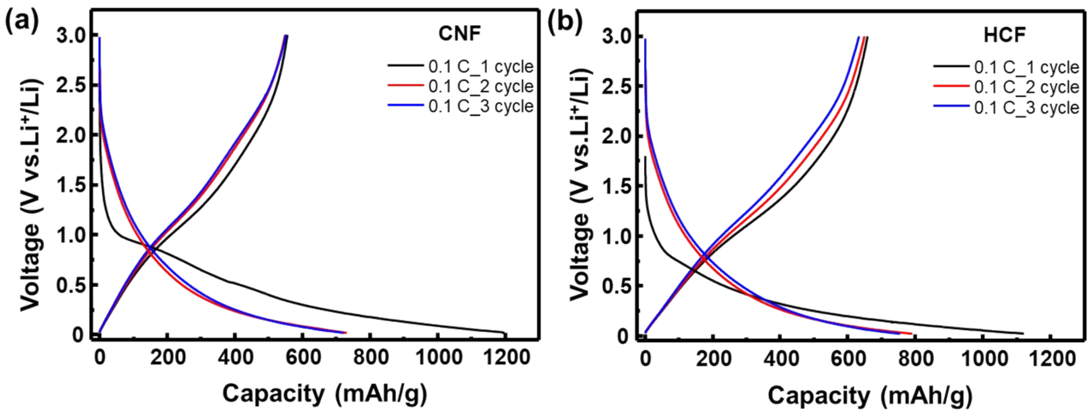

Figure S7. Galvanostatic charge–discharge profiles for the first three cycles at 0.1 C of (a) conventional carbon nanofiber (CNF)- and (b) hollow carbon nanofiber (HCF)-based anodes.