nanomaterials

Supplementary Materials: Nelumbo nucifera Seed—Derived Nitrogen-Doped Hierarchically Porous Carbons as Electrode Materials for High-Performance Supercapacitors

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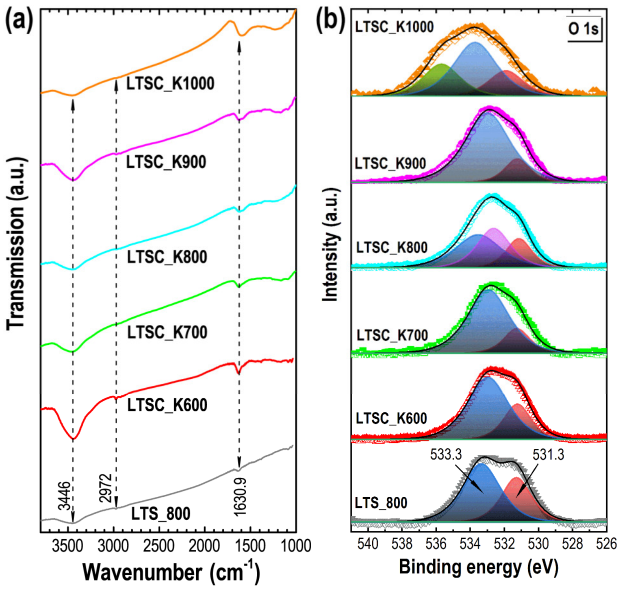

Figure S1. (**a**) FTIR spectra, and (**b**) XPS O 1s spectra with the deconvoluted peaks of the directly carbonized sample, LTS_800, and KOH activated samples; LTSC_K600, LTSC_K700, LTSC_K800, LTSC_K900, and LTSC_K1000.

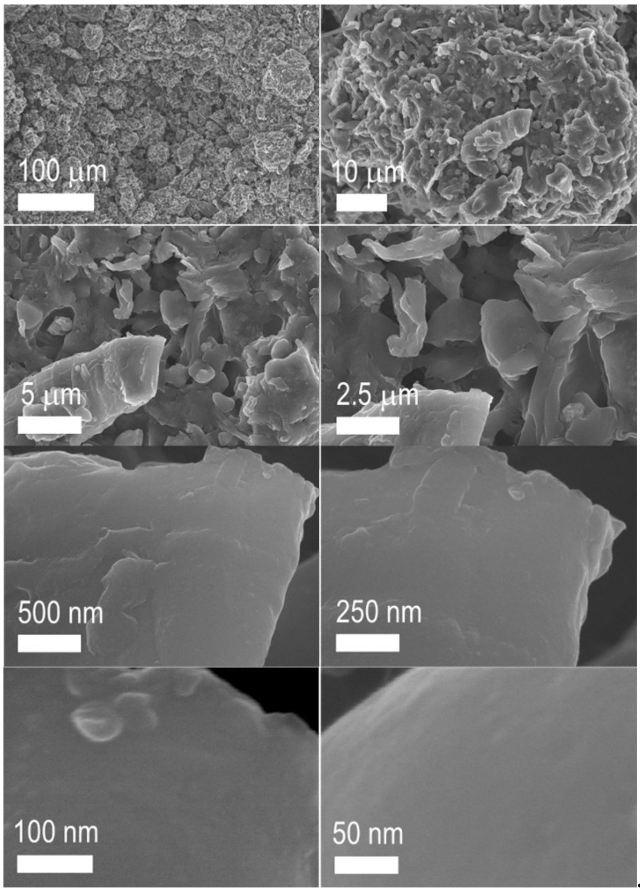

Figure S2. Additional SEM images of the LTS_800.

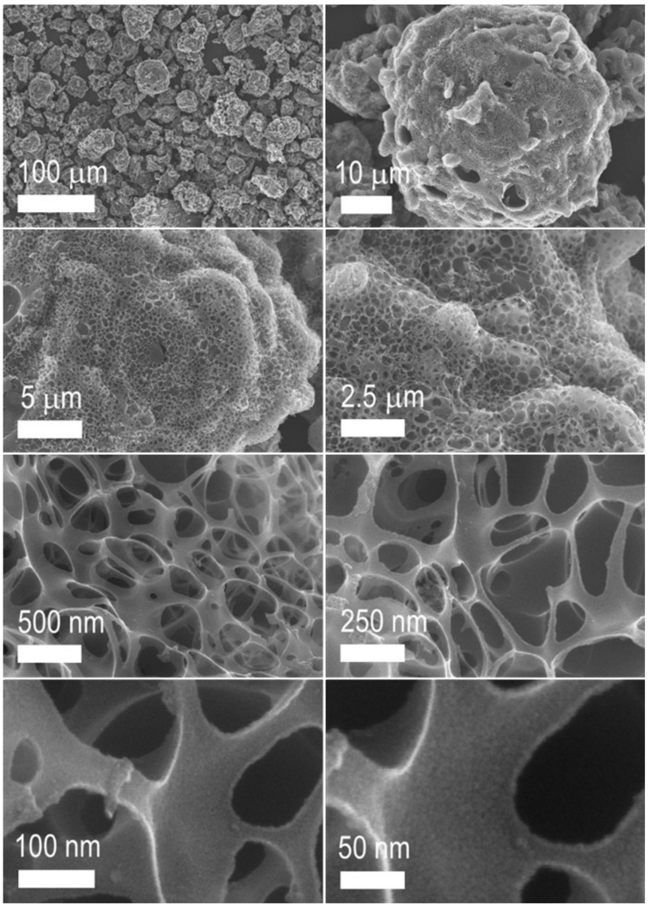

Figure S3. Additional SEM images of the LTSC_K600.

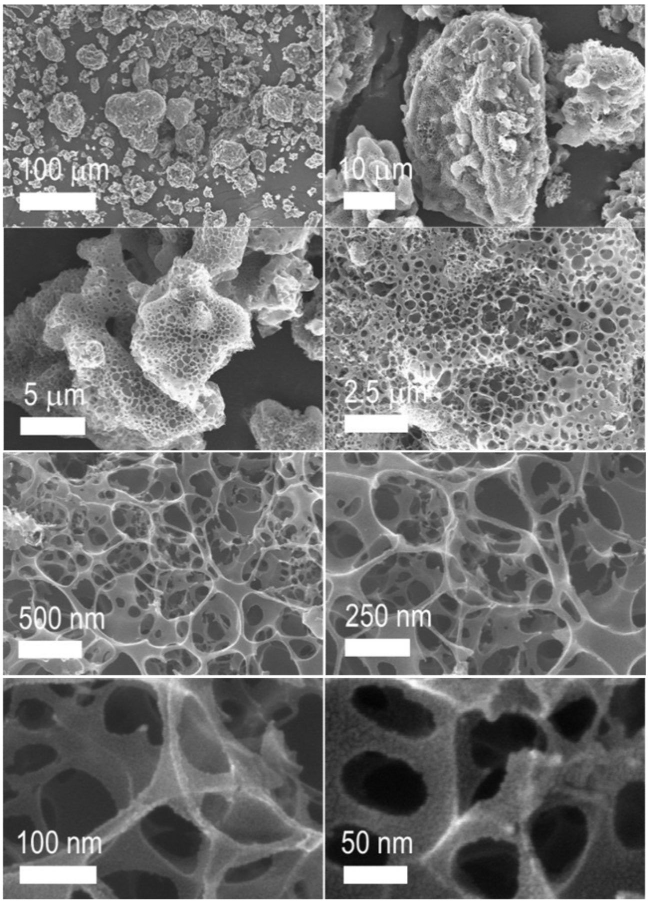

Figure S4. Additional SEM images of the LTSC_K700.

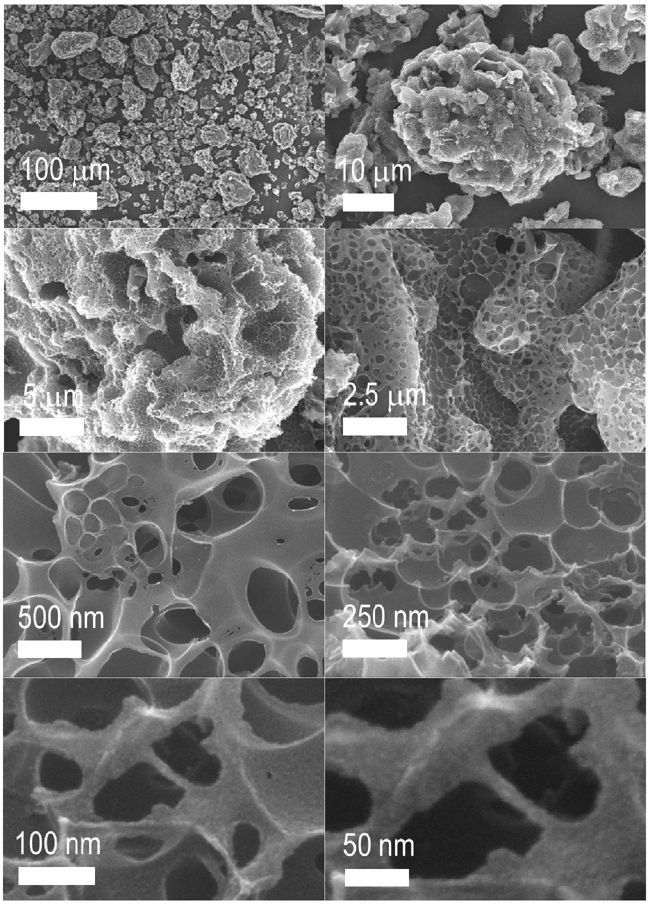

Figure S5. Additional SEM images of the LTSC_K800.

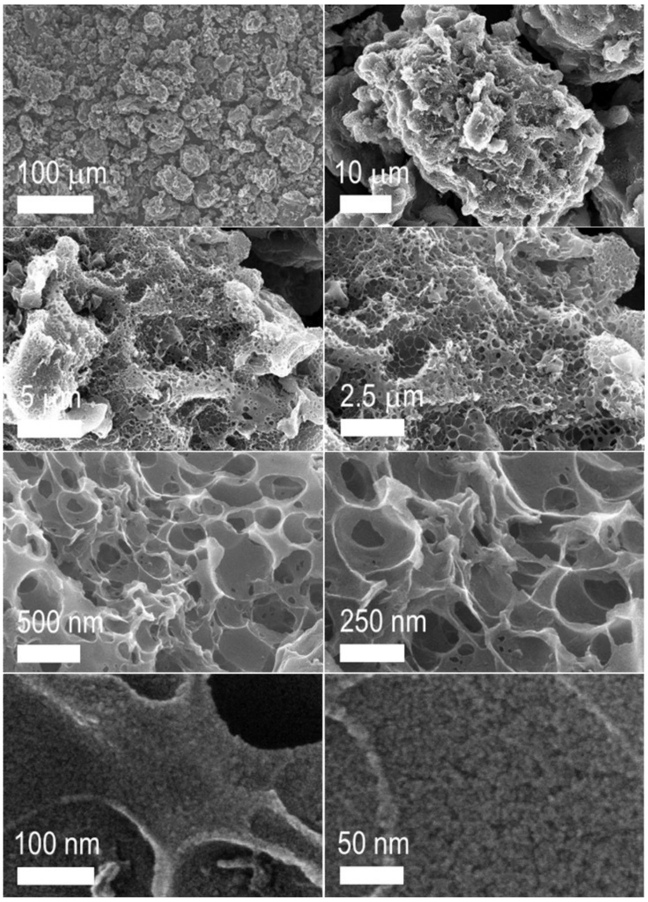

Figure S6. Additional SEM images of the LTSC_K900.

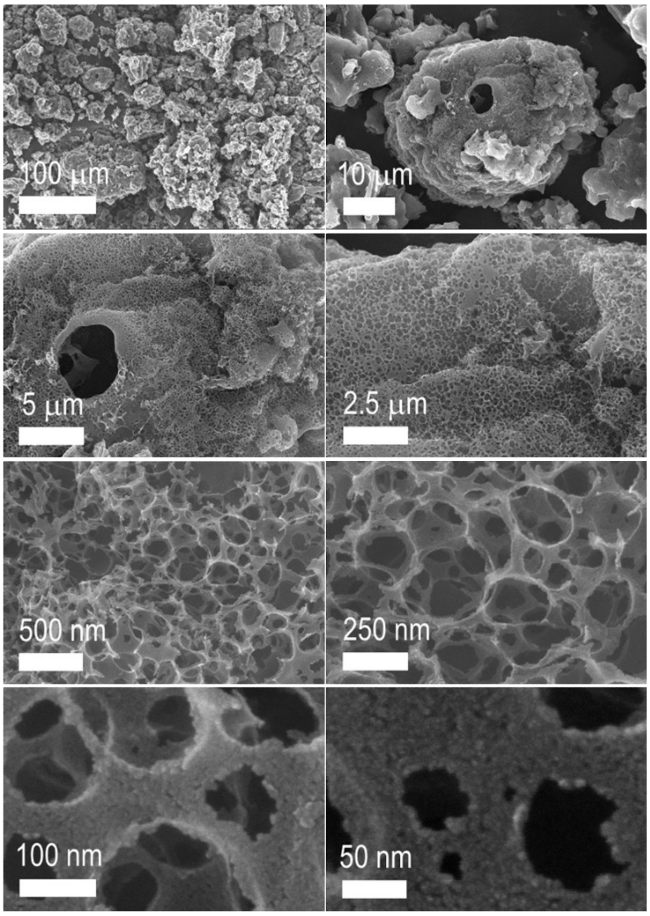

Figure S7. Additional SEM images of the LTSC_K1000.

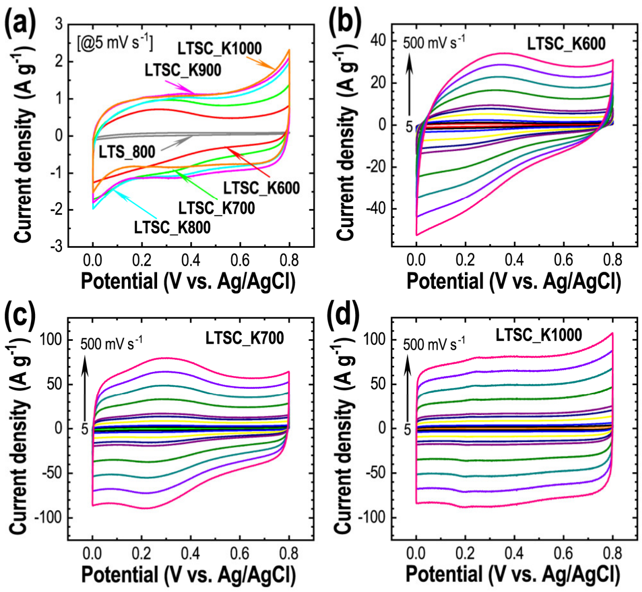

Figure S8. (**a**) The CV curves of all the samples at a fixed scan rate of 5 mV s^{-1} recorded at 25 °C, and the CV curves *vs.* scan rates for (**b**) LTSC_K600, (**c**) LTSC_K700, and (**d**) LTSC_K1000 systems.

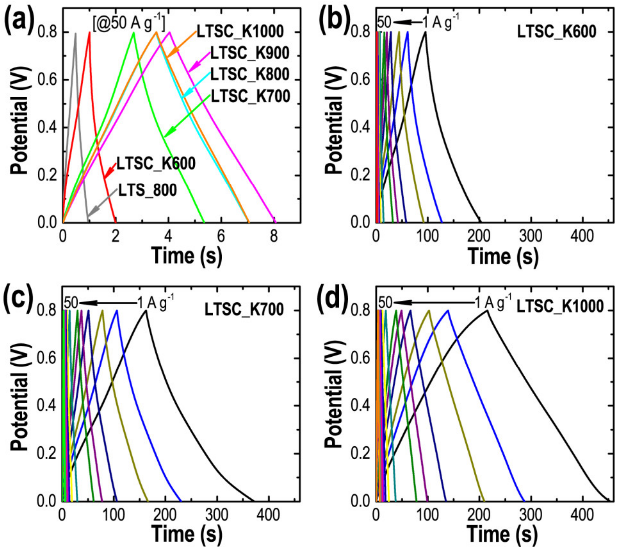

Figure S9. (**a**) The GCD curves at a constant current density of 50 A g^{-1}, and the GCD curves *vs*. current density for (**b**) LTSC_K600, (**c**) LTSC_K700, and (**d**) LTSC_K1000.

Table S1. Comparison of the electrochemical supercapacitance of the KOH activated *Nelumbo nucifera* (Lotus) seed carbon materials with activated carbon materials derived from other biomass.

Carbon precursors	T (°C)	Specific Surface Area (m^2 g^{-1})	N-content (at%)	Electrolyte	Current density (A g^{-1})	C_s (F g^{-1})	Potential window (V)	Cycle stability (%)	Reference
Lotus seed (KOH activated)	900	2330.1	0.91	1 M H_2SO_4	1	379.2	0.8	99% (10000 cycles)	This work
Albizia flowers	900	2757.63	1.34	6 M KOH	0.5	406	1.0	94% (10000 cycles)	[1]
Jackfruit seed (KOH activated)	900	2104.3	---	1 M H_2SO_4	1	323.8	0.8	97% (10000 cycles)	[2]
Jackfruit seed ($ZnCl_2$ activated)	800	1340.4	---	1 M H_2SO_4	1	261.3	0.8	99.4% (10000 cycles)	[3]
Washnut seed (KOH activated)	900	2034.9	---	1 M H_2SO_4	1	288.7	0.8	98% (10000 cycles)	[4]
Washnut seed ($ZnCl_2$ activated)	800	1309	---	1 M H_2SO_4	1	225.1	0.8	98% (10000 cycles)	[5]
Lotus seed ($ZnCl_2$ activated)	800	1316.7	---	1 M H_2SO_4	1	272.9	0.8	99.2% (10000 cycles)	[6]
Lapsi seed	700	2272	---	1 M H_2SO_4	1	284.0	0.8	99% (10000 cycles)	[7]
Corncob	400	1288	---	1 M H_2SO_4	1	261.6	0.8	96% (10000 cycles)	[8]
Cotton seed husk	800	584.49	---	6 M KOH	0.5	238	1.0	95.4% (6000 cycles)	[9]
Cottonseed hull	800	2573	8.44	6 M KOH	0.5	340	1.0	91% (5000 cycles)	[10]
Bio-decomposited product	800	3142	---	6 M KOH	0.05	209	1.0	97% (10000 cycles)	[11]
Bamboo (H_3PO_4 activated)	400	1431	---	1 M H_2SO_4	1	206.0	0.8	92.6% (1000 cycles)	[12]
Lignocellulose carbon	700	341	---	1 M NaCl	1	172.9	1.0	---	[13]
Biomass-derived lignin	800	559	---	6 M KOH	0.5	348	1.0	96%(10000 cycles)	[14]
Kraft lignin	800	1204	---	6 M KOH	0.1	155	1.2	94% (6000 cycles)	[15]
salvia splendens	800	1051	2.52	6 M KOH	1	294	1.0	94.7% (20000 cycles)	[16]
Quinoa	800	2597	1.97	6 M KOH	1	330	1.0	93% (10000 cycles)	[17]
Wood sawdust	850	2294	---	6 M KOH	0.5	225	1.0	94.2% (10000 cycles)	[18]
Wood	---	1123.9	---	1 M H_2SO_4	0.5	260	1.0	98% (5000 cycles)	[19]
Metaplexis Japonica seed	850	2041.8	2.5	6 M KOH	1	401.5	1.0	99.7% (20000 cycles)	[20]
Metaplexis Japonica shell	800	956.3	8	6 M KOH	2	457	1.6	97% (20000 cycles)	[21]
Commercial AC	---	879.8	---	2 M NaOH	1	427	1.0	---	[22]

(Calgon Carbon, USA)								
Commercial AC (YP-50)	---	1724	---	20 mol Kg^{-1} LiTFSI	1	118	2.4	61% (10000 cycles)	[23]

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