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Supplementary Information

Adjusting the Yolk-shell Structure of Carbon Spheres to Boost the Capacitive K^+ Storage Ability

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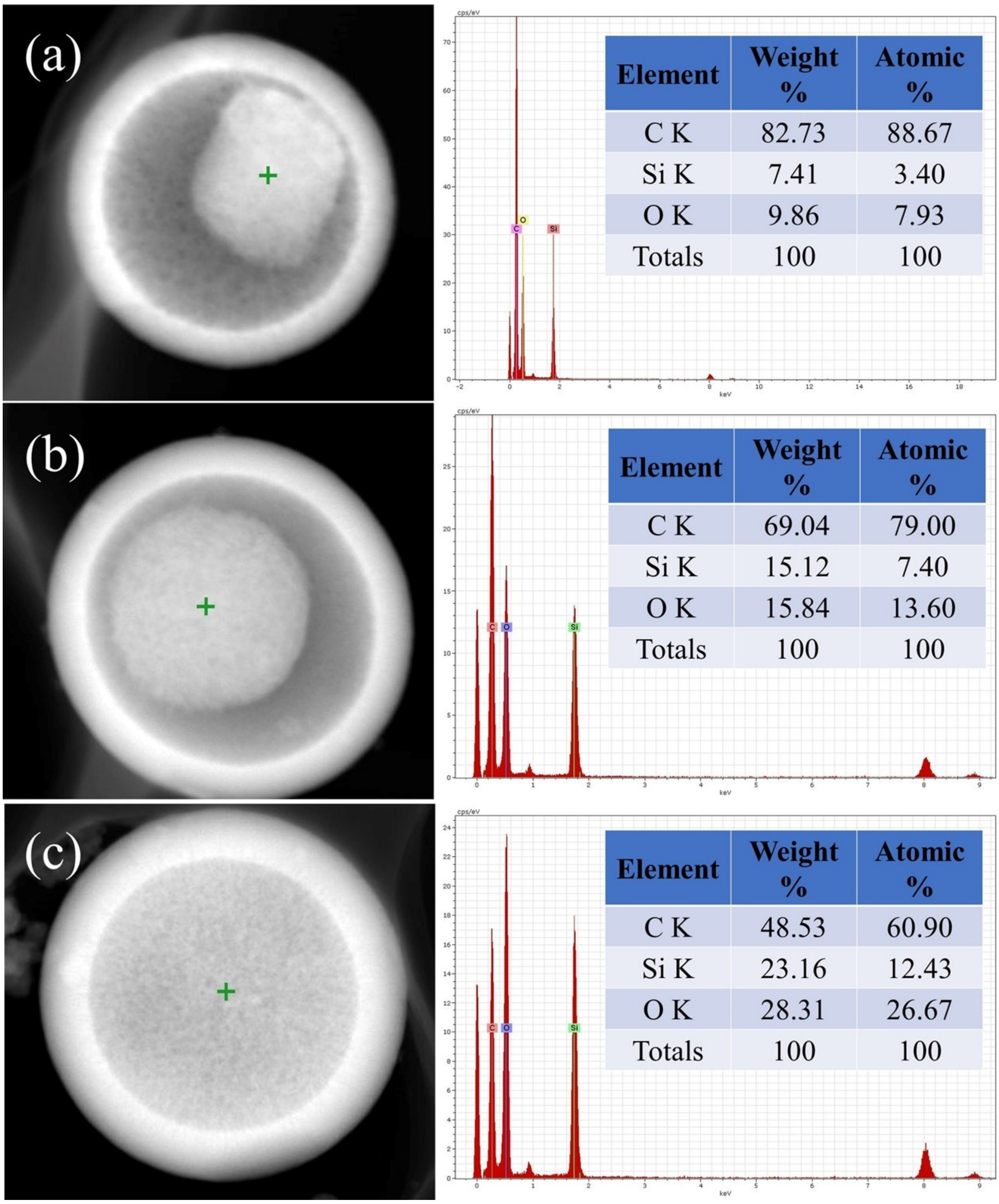

Figure S1 EDX spectra and the element composition of the yolk of SiO_2/C nanospheres: (a) SiO_2/C-1: 0.08 mmol L-1 TEOS; (b): SiO_2/C-2: 0.16 mmol L-1 TEOS and (c): SiO_2/C-3: 0.24 mmol L-1 TEOS.

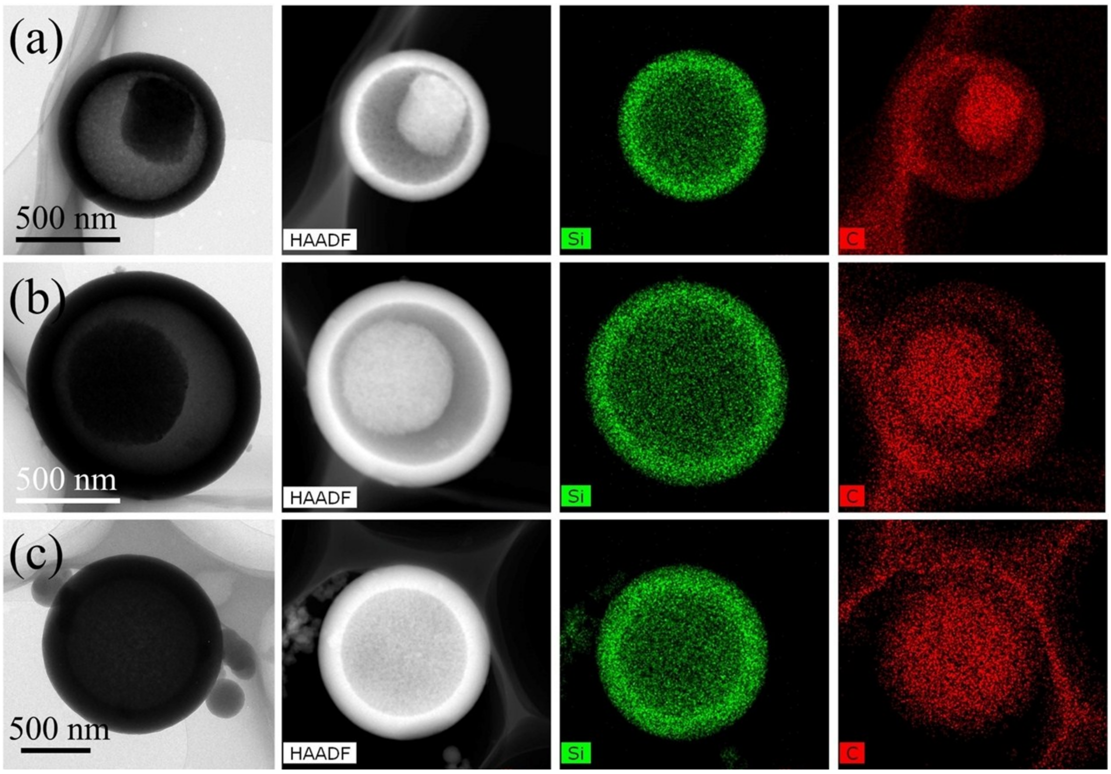

Figure S2 TEM images and elemental mapping images of (a) SiO_2/C-1, (b) SiO_2/C -2 and (c) SiO_2/C-3.

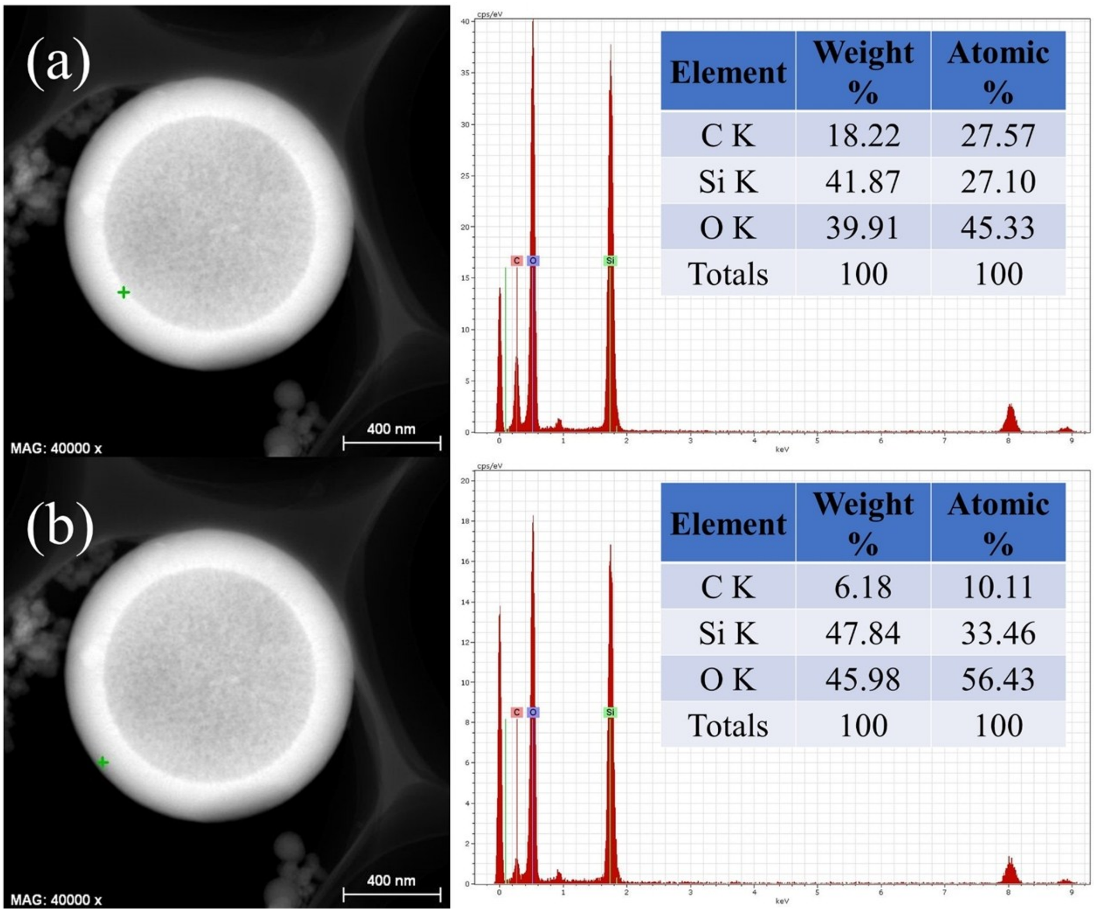

Figure S3 EDX spectra and the element composition of the inner and outer shell of SiO_2/C-3.

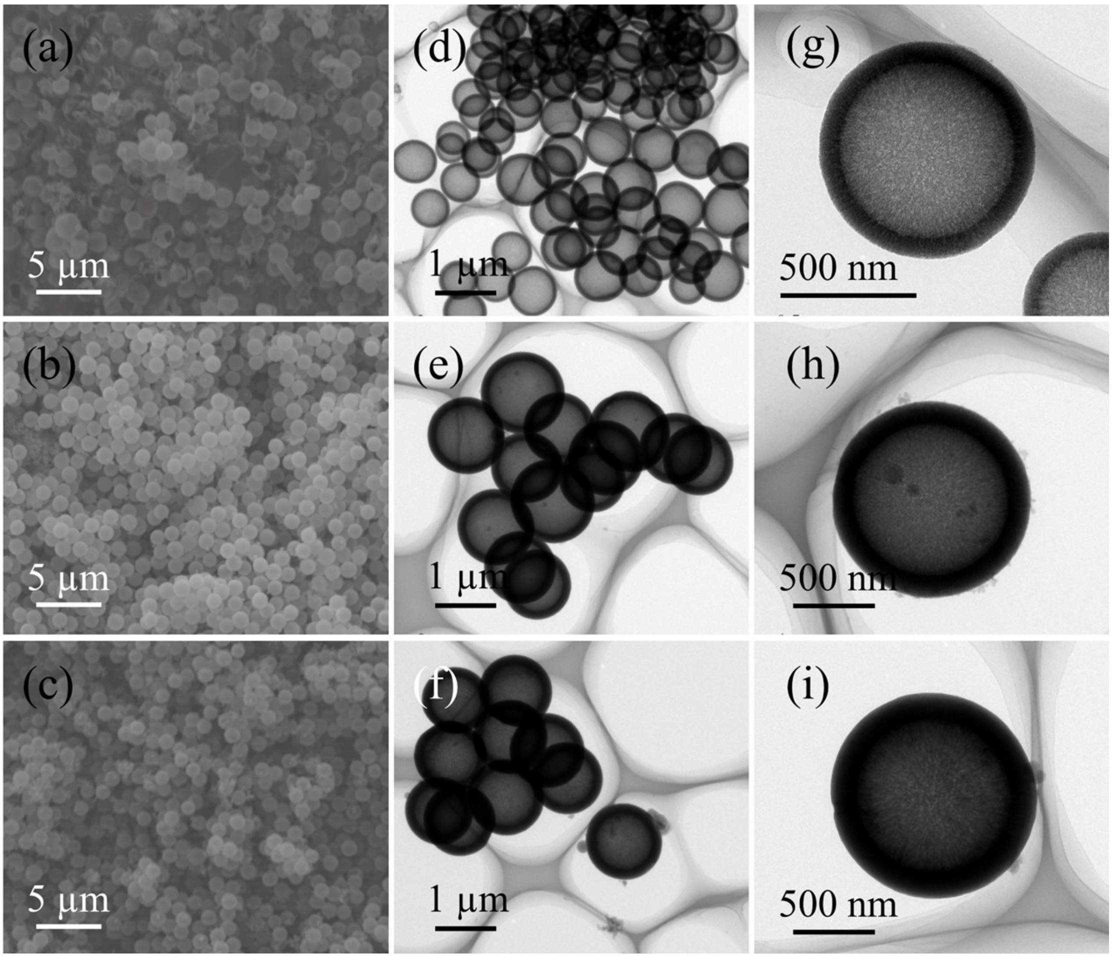

Figure S4 (a-c) SEM and (d-i) TEM images of the SiO_2 spheres: (a, d and g) SiO_2-1: 0.08 mmol L^{-1} TEOS; (b, e and h): SiO_2-2: 0.16 mmol L^{-1} TEOS and (c, f and i): SiO_2-3: 0.24 mmol L^{-1} TEOS.

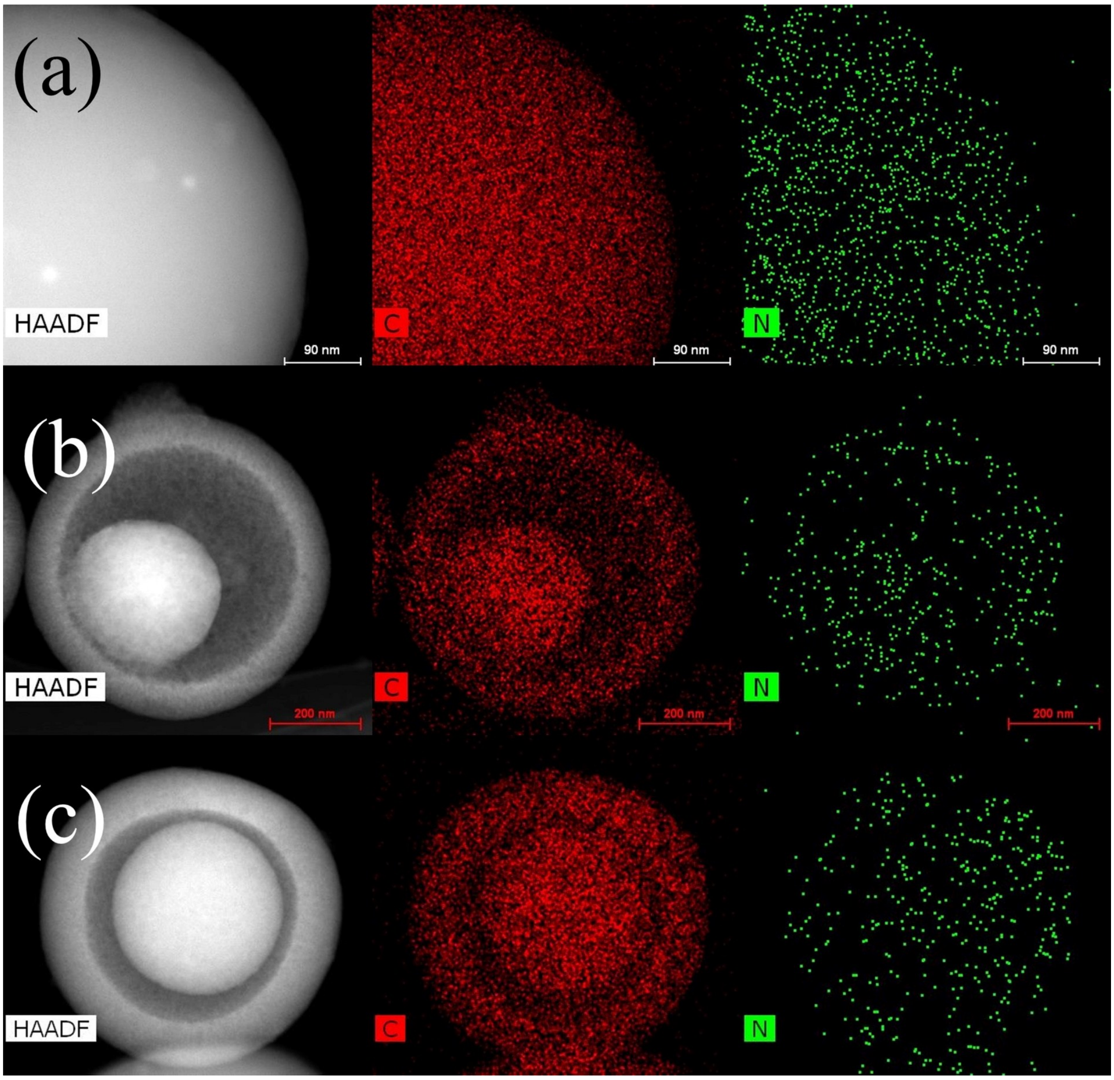

Figure S5 Element maps of (a) CS, (b) HYCS-1 and (c) HYCS-2.

Table S1. Atomic percentage of different samples calculated from the results of XPS

Materials	Atomic % (XPS)		
	C	N	O
CS	93.56	1.58	4.86
HYCS-1	94.29	1.65	4.05
HYCS-2	93.46	1.57	4.98
HYCS-3	93.73	1.64	4.63

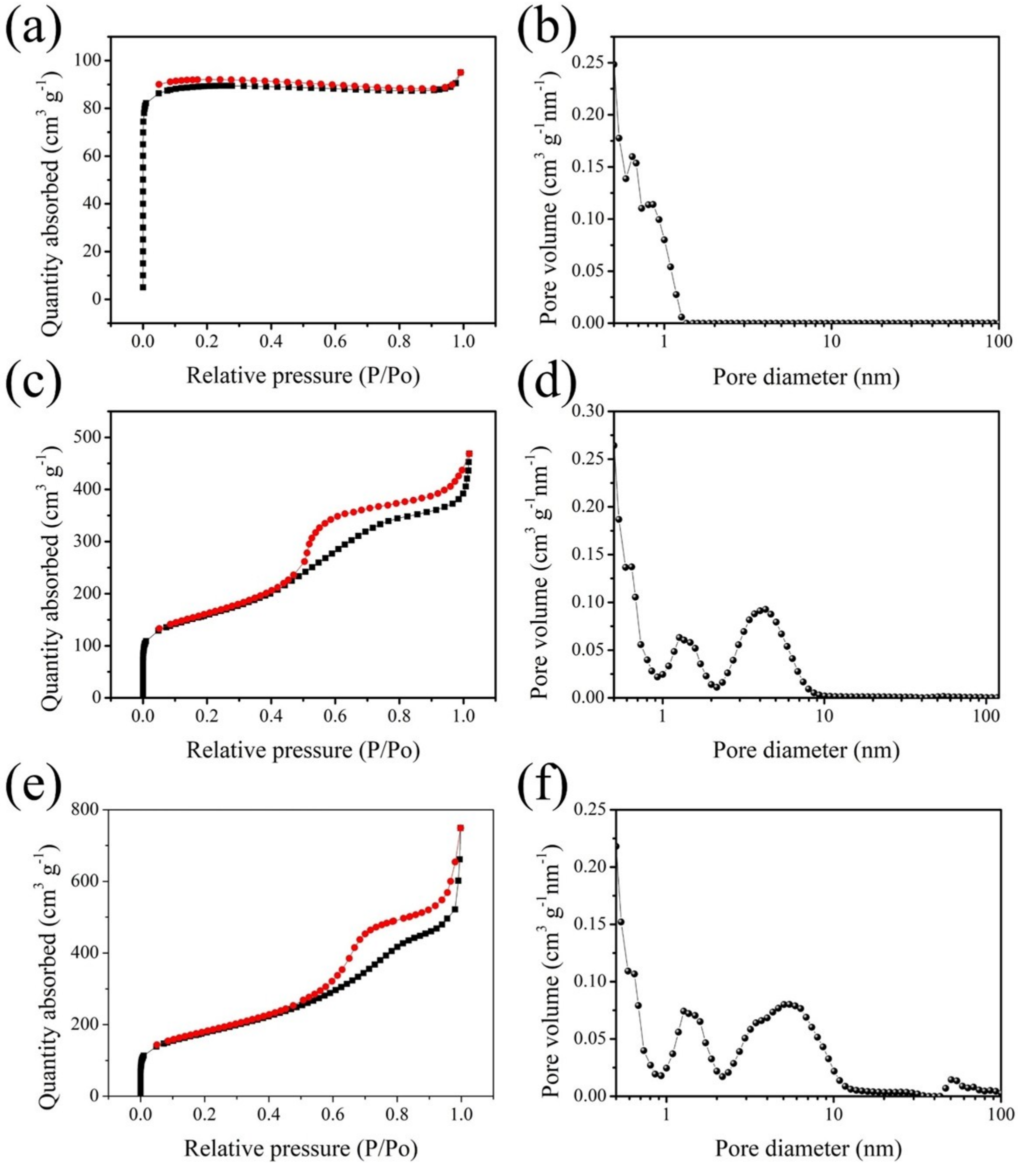

Figure S6 N_2 adsorption/desorption isotherm and pore size distribution of: (a, b) CS; (c, d) HYCS-1 and (e, f) HYCS-2.

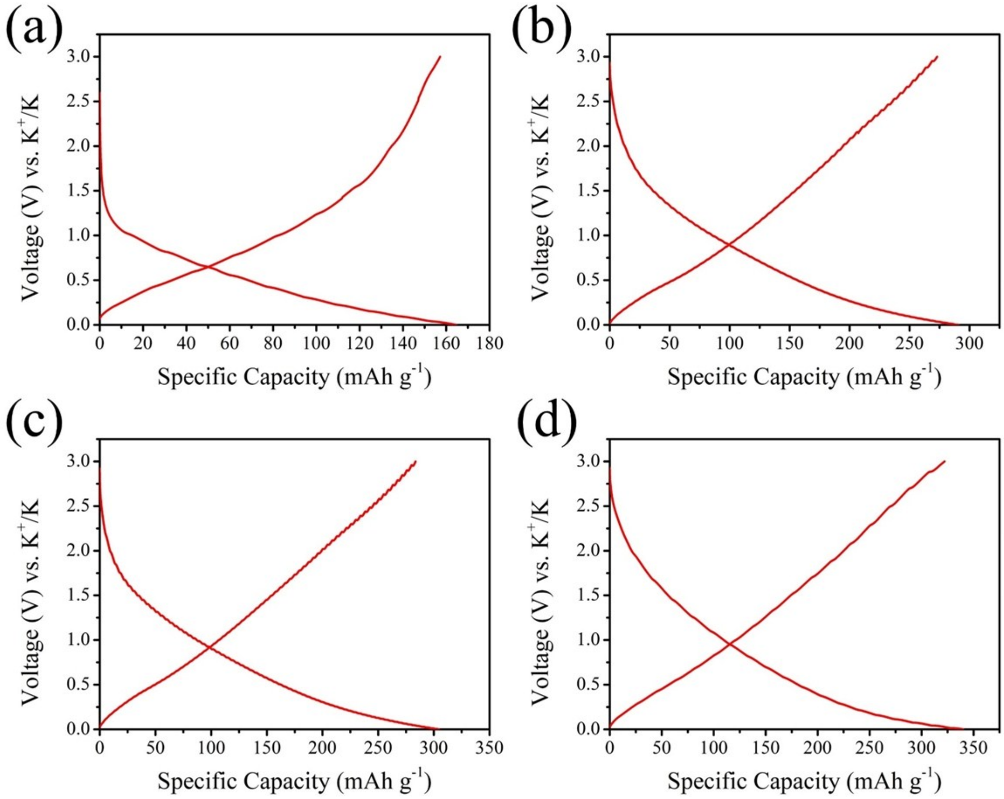

Figure S7 Charge-discharge curves at 50 mA g^{-1} of (a) CS, (b) HYCS-1, (c) HYCS-2 and (d) HYCS-3.

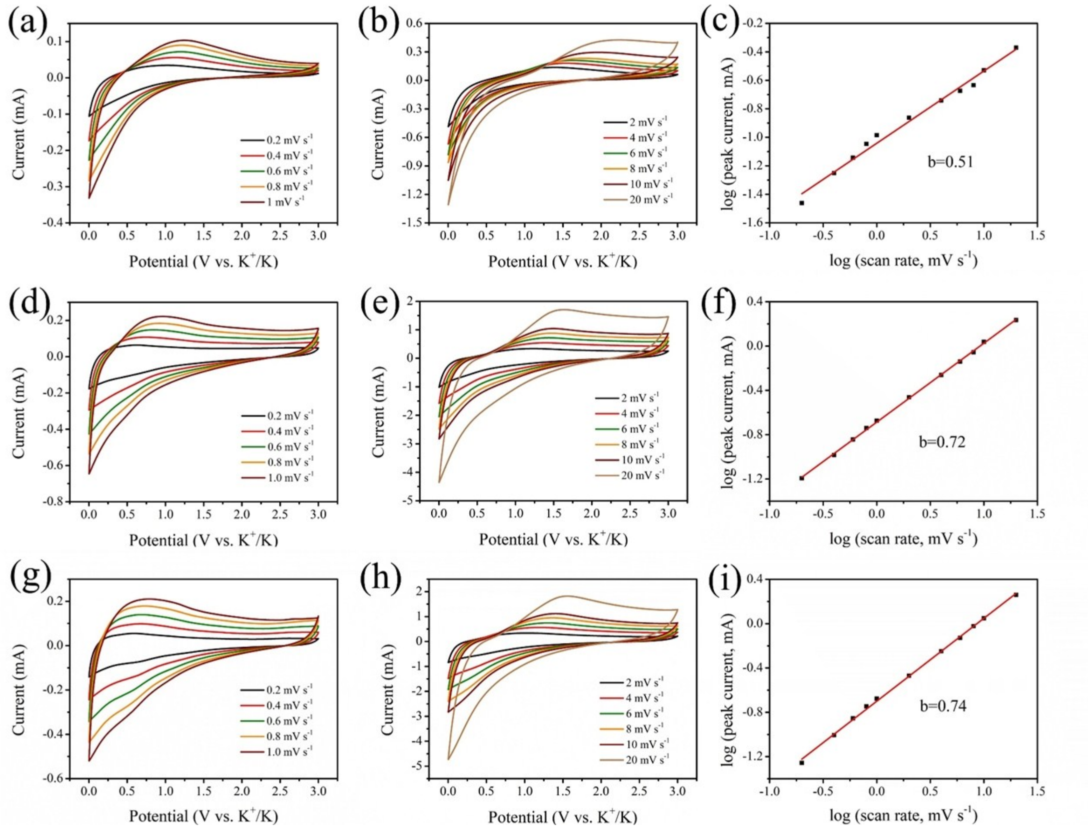

Figure S8 CV curves at different scan rates between 0.001 and 3.0 V for (a, b) CS, (d, e) HYCS-1 and (g, h) HYCS-2. The log(v)–log(i) profiles of (c) CS, (f) HYCS-1 and (i) HYCS-2.

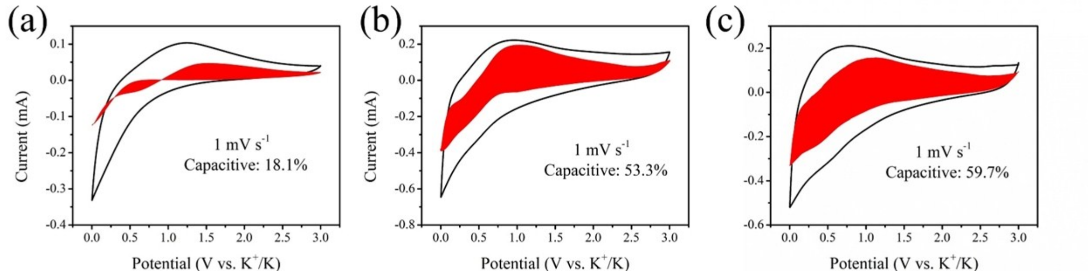

Figure S9 Separation of the capacitive and diffusion-controlled charges at 1 mV s^{-1} of (a) CS, (b) HYCS-1 and (c) HYCS-2.

Table S2. A comparison of potassium storage performance for several reported carbon materials

Negative electrode materials	Cyclability (mA h g^{-1})	Rate performance (mA g^{-1})	Reference
Graphite	100 at 140 mA g^{-1} after 50 cycles	263 at 28 mA g^{-1}; 172 at 140 mA g^{-1}; 80 at 280 mA g^{-1}	1
Hard carbon microspheres	216 at 28 mA g^{-1} after 100 cycles	262 at 28 mA g^{-1}; 205 at 280 mA g^{-1}; 136 at 1400 mA g^{-1}	2
Hard-soft composite carbon	200 at 280 mA g^{-1} after 200 cycles	230 at 140 mA g^{-1}; 190 at 190 mA g^{-1}; 81 at 2800 mA g^{-1}	3
Porous carbon nanofiber	211 at 20 mA g^{-1} after 1200 cycles	270 at 20 mA g^{-1}; 190 at 2000 mA g^{-1}; 140 at 5000 mA g^{-1}	4
N-doped carbon microsphere	180 at 500 mA g^{-1} after 4000 cycles	200 at 34 mA g^{-1}; 190 at 202 mA g^{-1}; 156 at 5040 mA g^{-1}	5
N/O dual-doped carbon	130 at 1050 mA g^{-1} after 1100 cycles	315 at 50 mA g^{-1}; 230 at 200 mA g^{-1}; 118 at 3000 mA g^{-1}	6
Hollow carbon nanospheres	212 at 560 mA g^{-1} after 100 cycles	298 at 28 mA g^{-1}; 210 at 280 mA g^{-1}; 155 at 1400 mA g^{-1}	7
Activated carbon	100 at 200 mA g^{-1} after 100 cycles	209 at 100 mA g^{-1}; 159 at 200 mA g^{-1}; 30 at 1000 mA g^{-1}	8
N-doped carbon nanotube	236 at 20 mA g^{-1} after 100 cycles	338 at 10 mA g^{-1}; 98 at 600 mA g^{-1}; 75 at 1000 mA g^{-1}	9
S/O codoped porous hard carbon microspheres	226.6 at 50 mA g^{-1} after 100 cycles	230 at 50 mA g^{-1}; 213 at 200 mA g^{-1}; 158 at 1000 mA g^{-1}	10
highly N-doped carbon nanofibers	248 at 25 mA g^{-1} after 100 cycles	238 at 100 mA g^{-1}; 217 at 200 mA g^{-1}; 101 at 20 A g^{-1}	11
N-doped hierarchical porous yolk-shell spheres	218 at 200 mA g^{-1} after 500 cycles	314 at 50 mA g^{-1}; 227 at 200 mA g^{-1}; 121 at 5000 mA g^{-1}	this work

Supplementary References

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