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Supporting Information

Fast-Response Supercapacitor with Graphitic Ordered Mesoporous Carbons and Carbon Nanotubes for AC Line Filtering

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Figure S1. Small-angle XRD pattern of the mesoporous CMK-3 powder.

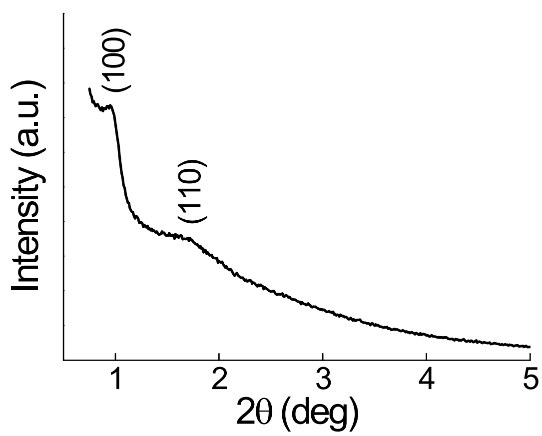

Figure S2. (a) Isotherm adsorption and desorption curve of the CMK-3 powder. (b) BJH-pore size distribution.

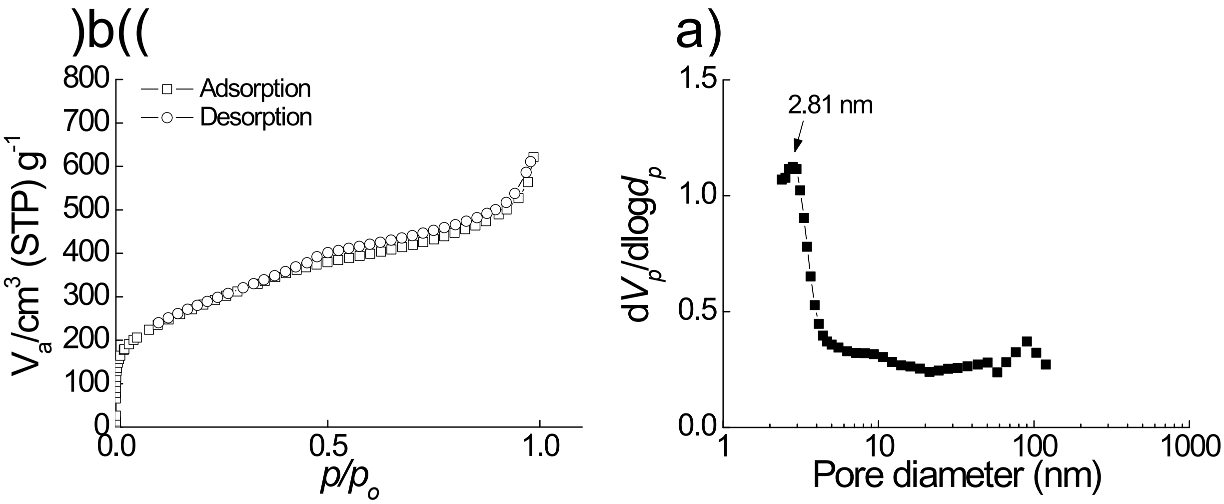

Table S1. Analysis of the XPS C1s peaks.

	C=C	C-C	C-OH	C=O	COOH
Assigned peak (eV)	284.3	285.2	286.39	287.52	288.04
Proportion of functional groups (%)	40.46	24.21	3.88	9.48	21.97

Table S2. Performance comparison of various supercapacitors and a commercial aluminum electrolytic capacitor (AEC).

Electrode material	τ_{RC} at 120 Hz [μs]	ϕ at 120 Hz [°]	C_{areal} at 120 Hz [μF/cm^2]	Voltage window [V]	E_{vol} [μWh/cc]	Replaceable voltage range [V]	Ref.
CMK-3/CNT	228	80.3	559	2.5	43.5	41	This work
SWCNT	181	82.2	282	2.5	22.1	21	[14]
SWCNT	199	81	601	0.8	4.8	4.6	[13]
VOGN	205	82	360	0.9	3.6	3.4	[6]
VOGN	N/A	85	265	1[a)]	3.2	3.0	[5]
G/CNT[b)]	195	81.5	230	1	2.5	2.3	[3]
ErGO	1350	84	283	0.8	1.7	1.6	[2]
VOGN	251	85	95.2	1[a)]	1.2	1.1	[4]
VOGN	200	82	87.5	1[a)]	1.1	1.0	[1]
AEC	195	81.9	39.2	10	10.4	-	[14]

SWCNT: single-walled carbon nanotube; VOGN: vertically oriented graphene nanosheet; G/CNT: graphene/carbon nanotube carpet; ErGO: electrochemically reduced graphene oxide; AEC: aluminum electrolytic capacitor. [a)] The voltage window was assumed to be 1 V because an aqueous electrolyte was used. [b)] Microsupercapacitor.

Equations

$$C_{areal} = \frac{I}{\frac{dV}{dt} \times area\ of\ a\ supercapacitor\ cell}$$

I is the discharge current and *dV/dt* is the discharge slope after the IR drop.

$$\tau_{RC} = R_{120\ Hz} \times C_{120\ Hz}$$

τ_{RC} is the RC time constant. $R_{120\ Hz}$ and $C_{120\ Hz}$ are the resistance and capacitance at 120 Hz, respectively.

$$C" = \frac{Z'}{2\pi f \cdot |Z|^2}$$

C'', *f*, and |*Z*| are the imaginary parts of the capacitance, frequency, and magnitude of impedance, respectively.

$$C_{areal} = \frac{-1}{2\pi f S Z"}$$

S is the area of an electrode and *Z''* is the imaginary part of the impedance.

$$C_{vol} = \frac{C_{areal}\ at\ 120\ Hz}{Total\ thickenss\ of\ a\ supercapacitor\ cell}$$

$$= \frac{C\ at\ 120\ Hz}{Total\ volume\ of\ a\ supercapacitor\ cell}$$