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Supporting Information

Ion-matching porous carbons with ultra-high surface area and superior energy storage performance for supercapacitors

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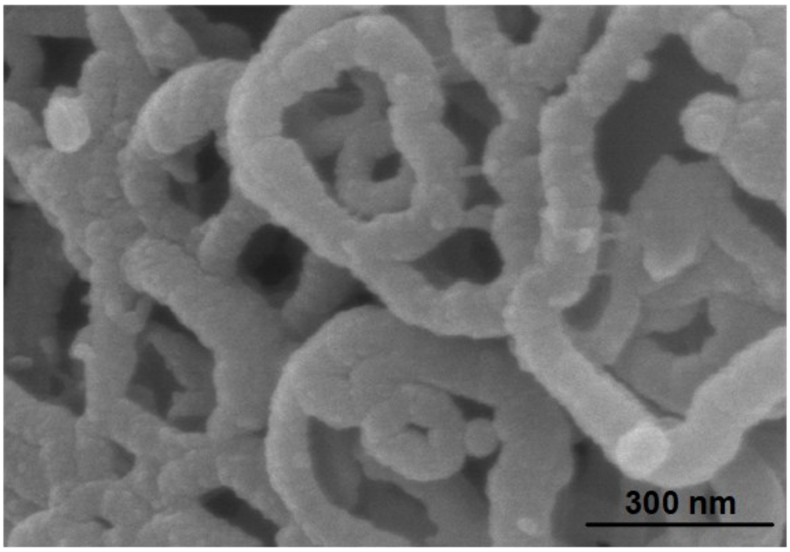

Figure S1. SEM image of PPy rings.

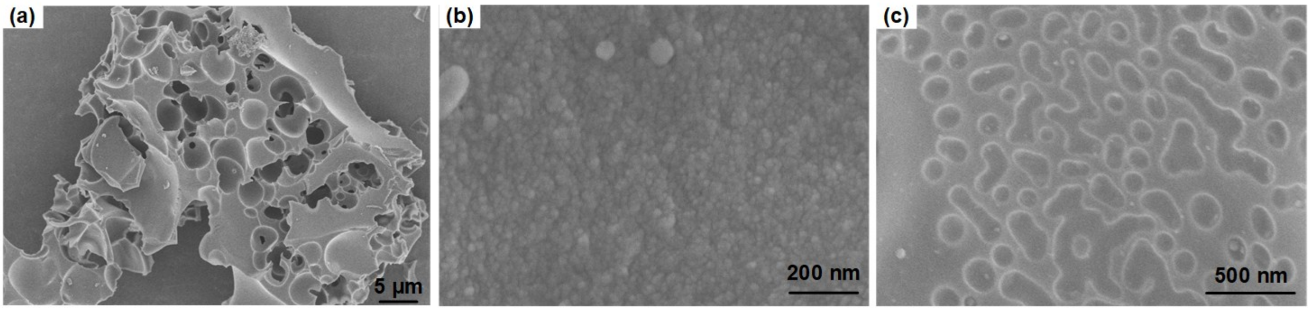

Figure S2. SEM images of PPC-700: (a) at low-magnification; (b) accidented surface; (c) wormlike pits.

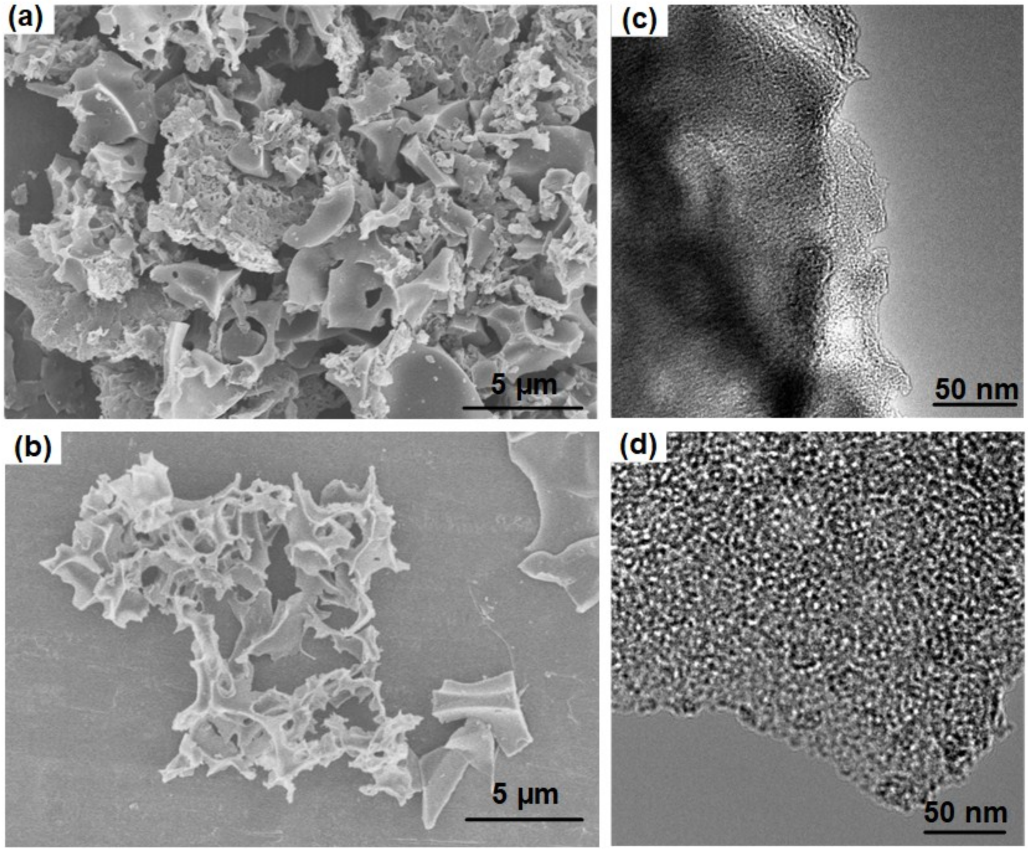

Figure S3. The morphology of the PPC-600 and PPC-800: (a) SEM image of PPC-600. (b) SEM image of PPC-800. (c) TEM image of PPC-600. (d) TEM image of PPC-800.

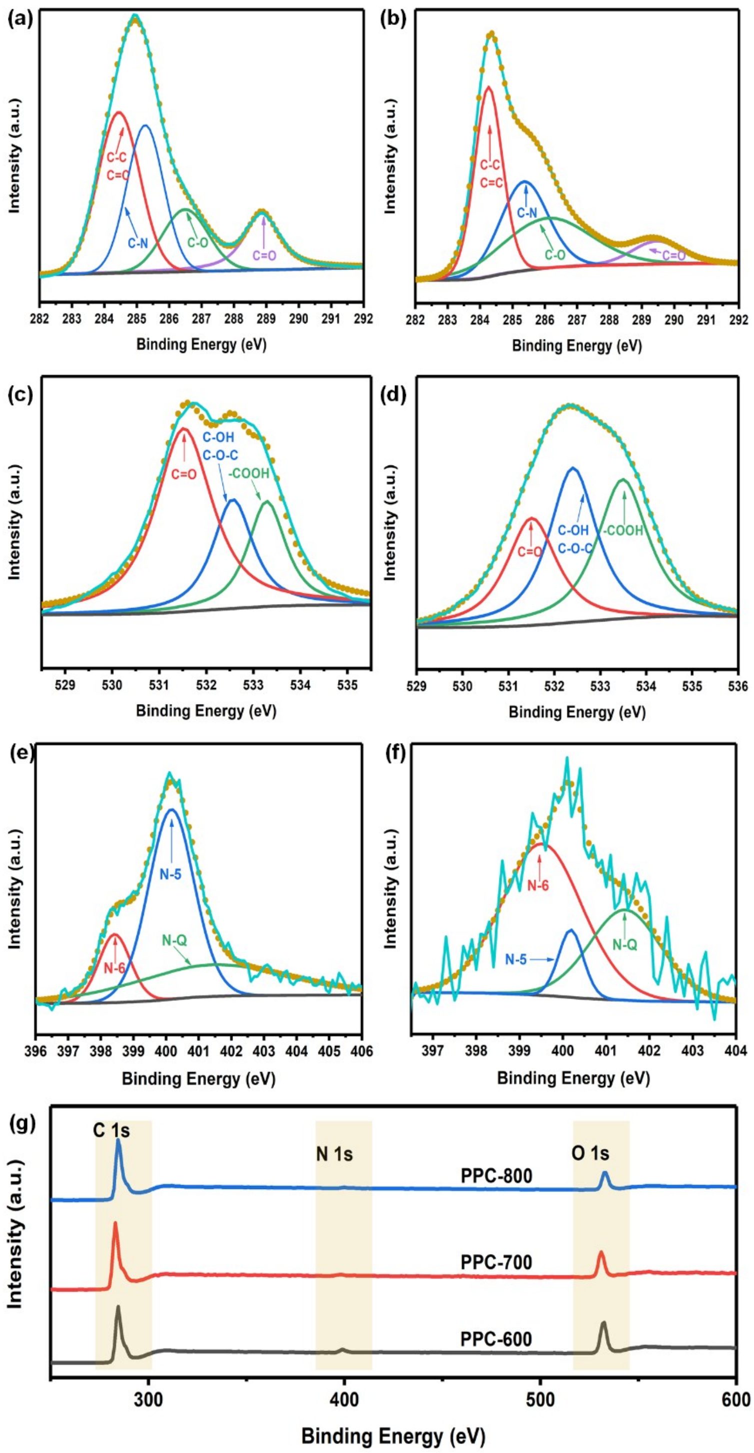

Figure S4. High-resolution XPS spectra of PPC-600 (a) C 1s, (c) O 1s, and (e) N 1s; PPC-800 (b) C 1s, (d) O 1s, and (f) N 1s; (g) XPS survey spectra of PPC-600, PPC-700 and PPC-800.

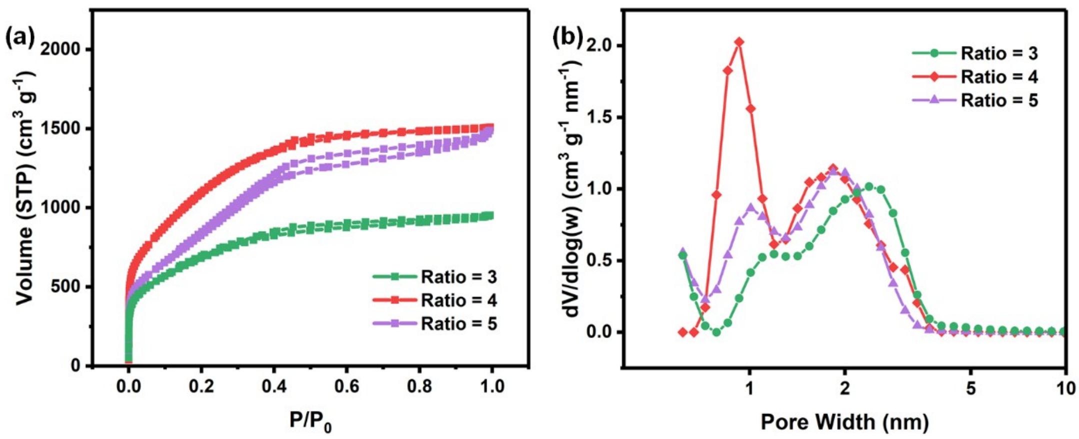

Figure S5. (a) Nitrogen adsorption-desorption isotherms and (b) the corresponding pore size distribution of PPC samples prepared by different KOH amount at 700 °C.

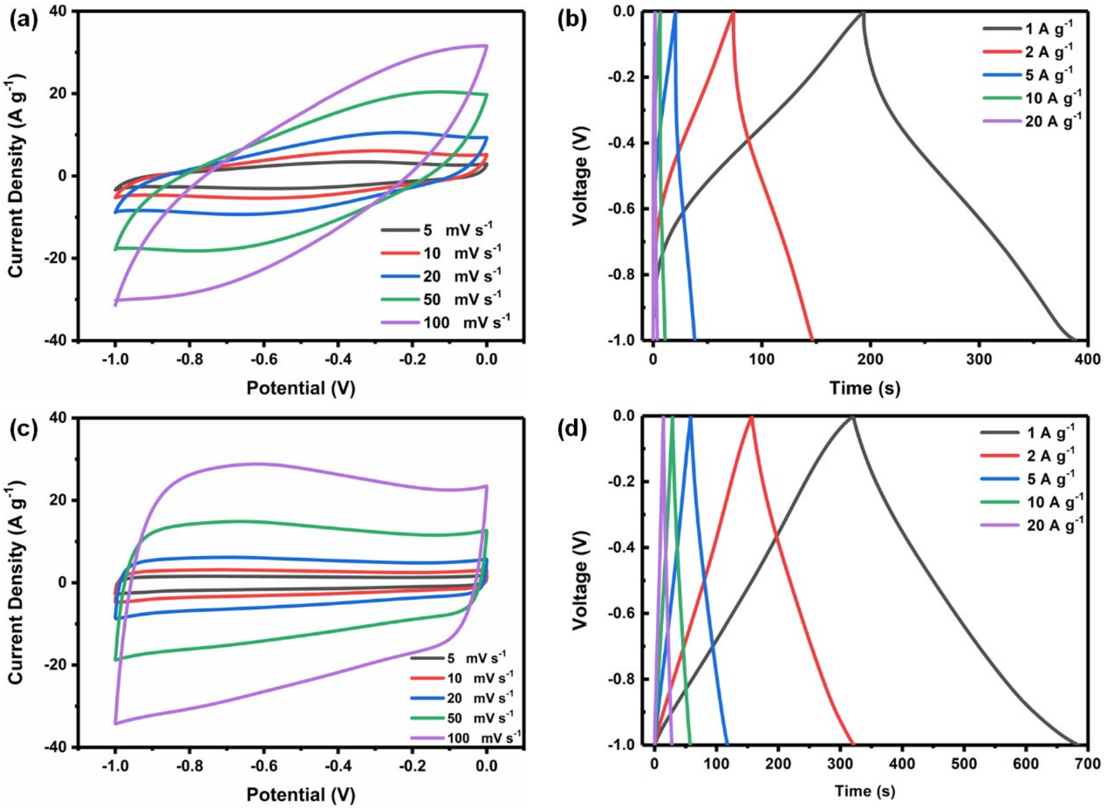

Figure S6. Electrochemical performance of PPC-600 and PPC-800 in 3-electrode test using 6 M KOH electrolyte with a potential window of 1.0 V: (a) Cyclic voltammetry of PPC-600 at various scan rates of 5, 10, 20, 50 and 100 mV s^{-1}; (b) Galvanostatic charge-discharge profiles of PPC-600 at current densities of 1, 2, 5, 10 and 20 A g^{-1}; (c) Cyclic voltammetry of PPC-800 at various scan rates of 5, 10, 20, 50 and 100 mV s^{-1}; (d) Galvanostatic charge-discharge profiles of PPC-800 at current densities of 1, 2, 5, 10 and 20 A g^{-1}.

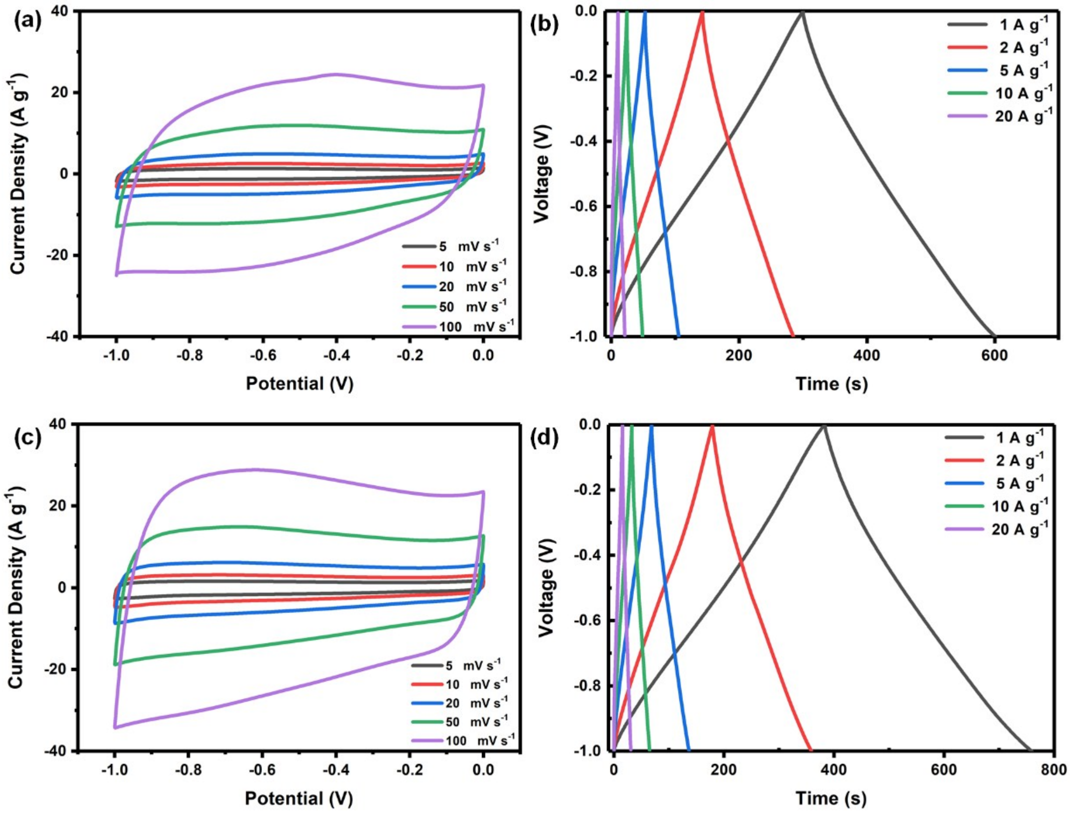

Figure S7. Electrochemical performance of PPC samples prepared by different KOH amount at 700 °C in 3-electrode test using 6 M KOH electrolyte with a potential window of 1.0 V: (a) Cyclic voltammetry at various scan rates of 5, 10, 20, 50 and 100 mV s^{-1} when mass ratio of KOH : PPy equals 3; (b) Galvanostatic charge-discharge profiles at current densities of 1, 2, 5, 10 and 20 A g^{-1} when mass ratio of KOH : PPy equals 3; (c) Cyclic voltammetry at various scan rates of 5, 10, 20, 50 and 100 mV s^{-1} when mass ratio of KOH : PPy equals 5; (d) Galvanostatic charge-discharge profiles at current densities of 1, 2, 5, 10 and 20 A g^{-1} when mass ratio of KOH : PPy equals 5.

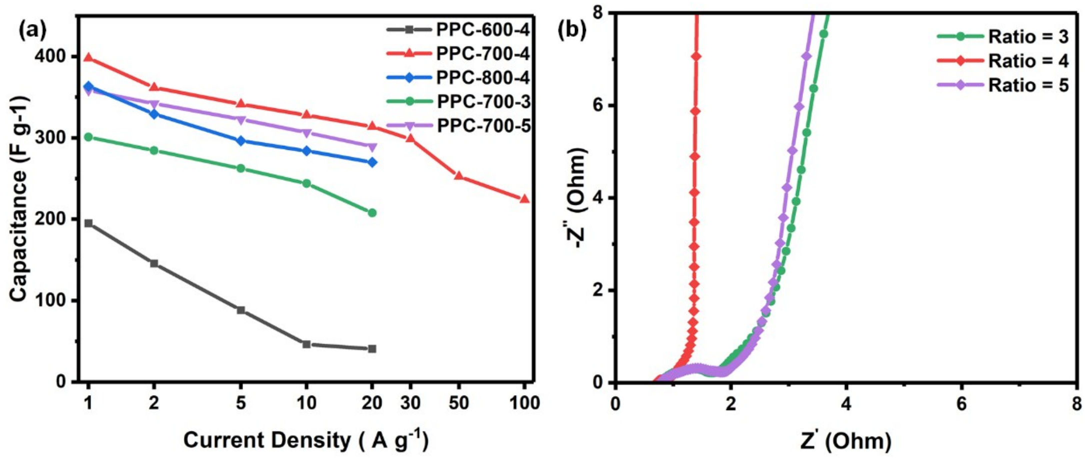

Figure S8. (a) capacitive performance at di□erent current densities (PPC-X-Y: X means temperature, Y means KOH amount.) (b) Nyquist plots of PPC samples prepared by different KOH amount at 700 °C in a frequency range of 0.01 to 10^5Hz with 5mV amplitude.

Table S1. Textural properties of PPC samples prepared by different KOH amount at 700 °C

ratio[a]	SSA[b] (m^2 g^{-1})	Pore Volume (cm^3 g^{-1})			
		V_{Total}	V^c_{Small}(%)	V^d_{Close}(%)	V^e_{Large}(%)
3	3156.38	2.301	0.241(11%)	0.514(22%)	1.546(67%)
4	4091.54	2.334	0.062(2%)	0.946(41%)	1.326(57%)
5	3699.61	2.060	0.263(13%)	0.611(30%)	1.186(57%)

[a]) KOH : PPy

[b]) Specific Surface Area calculated by Brunauer-Emmett-Teller (BET) method in the relative pressure range of 0.05-0.20

[c]) Volume of pores smaller than 0.5 nm in width

[d]) Volume of pores between 0.5 and 1 nm in width

[e]) Volume of pores larger than 1 nm in width

Table S2. Summary of capacitive performance of carbon-based supercapacitors

Carbon source	SSA (m^2 g^{-1})	Capacitance (F g^{-1})	Current density (A g^{-1})	Electrolyte	Cycles (Current density/Scanning rate)	Capacitance retention	Ref.
PPy	4091.54	397.9	1A g^{-1}	6 M KOH	30K (10A g^{-1})	95%	This work
PPy	2870	318.2	0.5A g^{-1}	6 M KOH	10K (5A g^{-1})	95.8%	[1]
PANi	4073	225	0.5A g^{-1}	0.5 M H_2SO_4	10K (5A g^{-1})	96%	[2]
chitosan	2905	374.7	1A g^{-1}	3 M KOH	20K (200mV/s)	98%	[3]
popcorn	3301	311	10A g^{-1}	6 M KOH	10K (5A g^{-1})	95%	[4]
ZIF-8/PAN	417.9	307.2	1A g^{-1}	2 M H_2SO_4 (two-electrode)	10K (5A g^{-1})	98.2%	[5]
non-fat powdered milk	4051	247	25 A g^{-1}	6 M KOH (two-electrode)	75K (25A g^{-1})	80%	[6]
commercial silicone resin	2896	322	0.5 A g^{-1}	6 M KOH	10K (5A g^{-1})	93.3%	[7]
petroleum asphalt	3581	194	20 A g^{-1}	6 M KOH	10K (2A g^{-1})	95.1%	[8]
phenol formaldehyde resin	1224	388	1A g^{-1}	1 M H_2SO_4	8K (5A g^{-1})	98%	[9]
polyphosphazene	1798	105	0.3A g^{-1}	6 M KOH (two-electrode)	10K (5A g^{-1})	89.5%	[10]
PMMA/bacterial cellulose	2076	266	0.5A g^{-1}	1 M H_2SO_4	10K (5A g^{-1})	95%	[11]
bradyrhizobium japonicum	1275	358	1A g^{-1}	6 M KOH (two-electrode)	8K (1A g^{-1})	91%	[12]
carbon aerogel	450	151	0.5A g^{-1}	6 M KOH	0.5K (0.5A g^{-1})	97.8%	[13]

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