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Supporting Information

Inherent N,O-Containing Carbon Frameworks as Electrode Materials for High-Performance Supercapacitors

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Experimental

Materials. All starting materials, except for 4,4'-(1,5-dioxo-4,8-diphenyl-2,3,6,7-tetraazaanthracene-diyl)dibenzonitrile (DPDN), were purchased commercially and used without further purification.

Synthesis of 4,4'-(1,5-dioxo-4,8-diphenyl-2,3,6,7-tetraazaanthracene-diyl) dibenzonitrile (DPDN).

2,3,7,8-Tetraazaanthracenedione. It was prepared based on the existing report,[1,2] yield 90%. ^{1}H-NMR (500 MHz, DMSO-d_6) δ7.45-7.70 (m, ~12H), 8.05 (s, 1H), 8.55 (s, 0.4H) 9.18 (s, 1H), 13.14 (s, ~2H); TOF MS EI$^+$ calcd for $C_{22}H_{14}N_4O_2$: 366.1117; Found: 366.1106. Anal. Calcd for $C_{22}H_{14}N_4O_2$: C, 72.12; H, 3.85; N, 15.29. Found: C, 72.36; H, 3.86; N, 15.68.

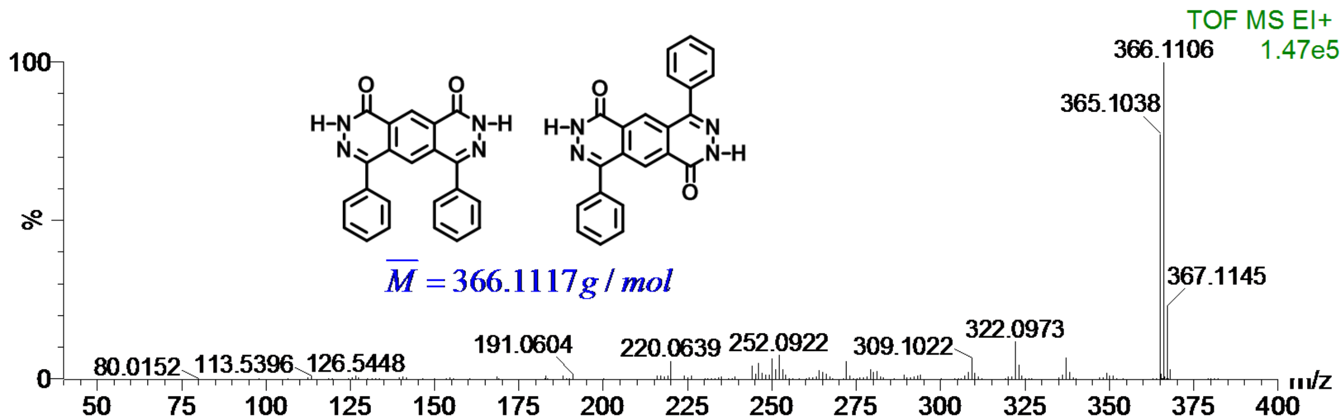

Fig. S1 The mass spectrum of 2,3,7,8-Tetraazaanthracenedione.

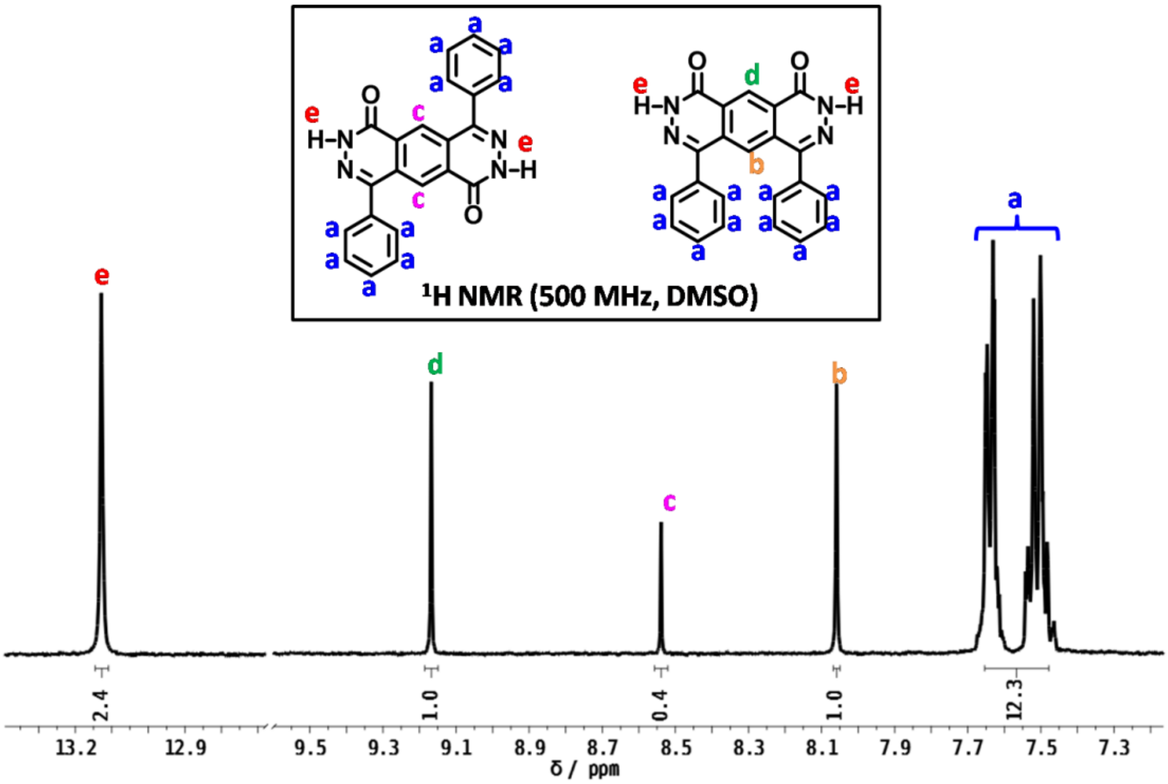

Fig. S2 The ^{1}H NMR of 2,3,7,8-Tetraazaanthracenedione.

4,4'-(dioxodiphenyl-2,3,6,7-tetraazaanthracene-diyl)dibenzonitrile (DPDN). Dimethyl Sulphoxide (DMSO, 10mL) was stirred cautiously with 2,3,7,8-tetraazaanthracenedione (8 mmol) and 4-fluoro- benzonitrile (16 mmol) in a 100 mL round-bottom flask. Then, alkali halide (18 mmol) was added by stirring cautiously at 100 ^{o}C. Stirring at 170 °C was maintained for over 8 h. The resulting solution was poured into anhydrous ethanol. The solid was then filtered off, washed successively with acetone (5×30 mL) before drying at 80 °C. This yielded the product as an amorphous yellow solid, almost insoluble in common solvents, yield 93%, *m.p.*: 293, 310 ^{o}C (DSC); $T_{d,max}$: 500 ^{o}C (TGA); ^{1}H-NMR (500 MHz, DMSO-d_6) δ7.50-7.54 (m, 5H), 7.56-7.60 (m, 4H), 7.68-7.70 (m, 6H), 7.94-7.96 (m, 12H), 8.08-8.10 (s, 1H), 8.63 (s, 1H) 9.35 (s, 1H); TOF MS EI$^+$ calcd for $C_{22}H_{14}N_4O_2$: 568.1648; Found: 568.1655. Anal. Calcd for $C_{36}H_{20}N_6O_2$: C, 76.05; H, 3.55; N, 14.78. Found: C, 75.85; H, 3.55; N, 14.81.

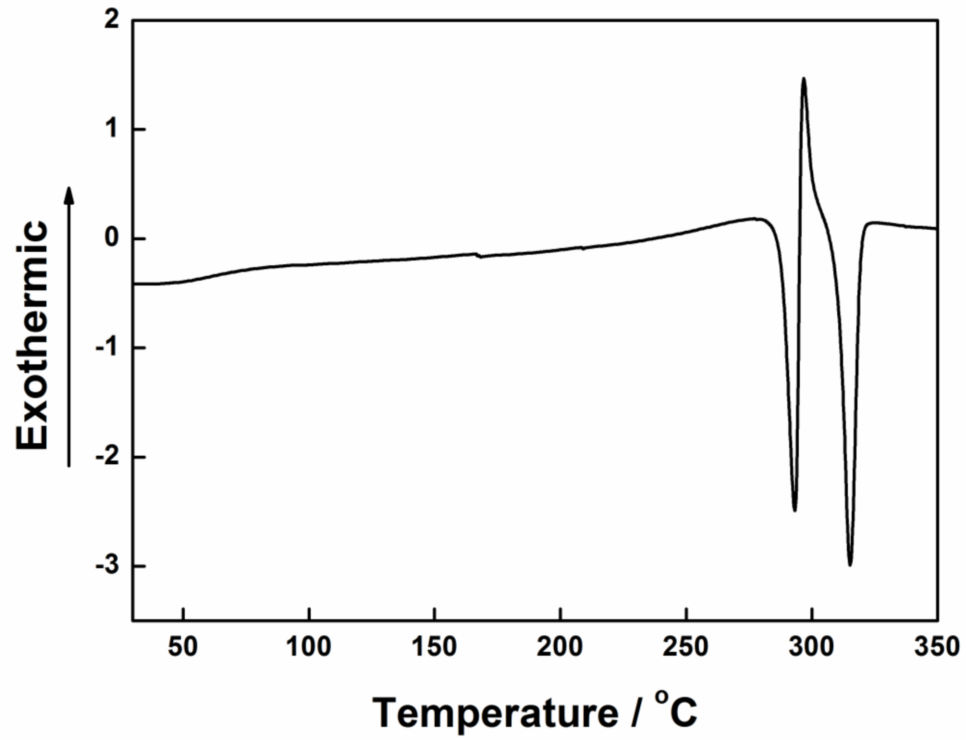

Fig. S3 The DSC curve of DPDN.

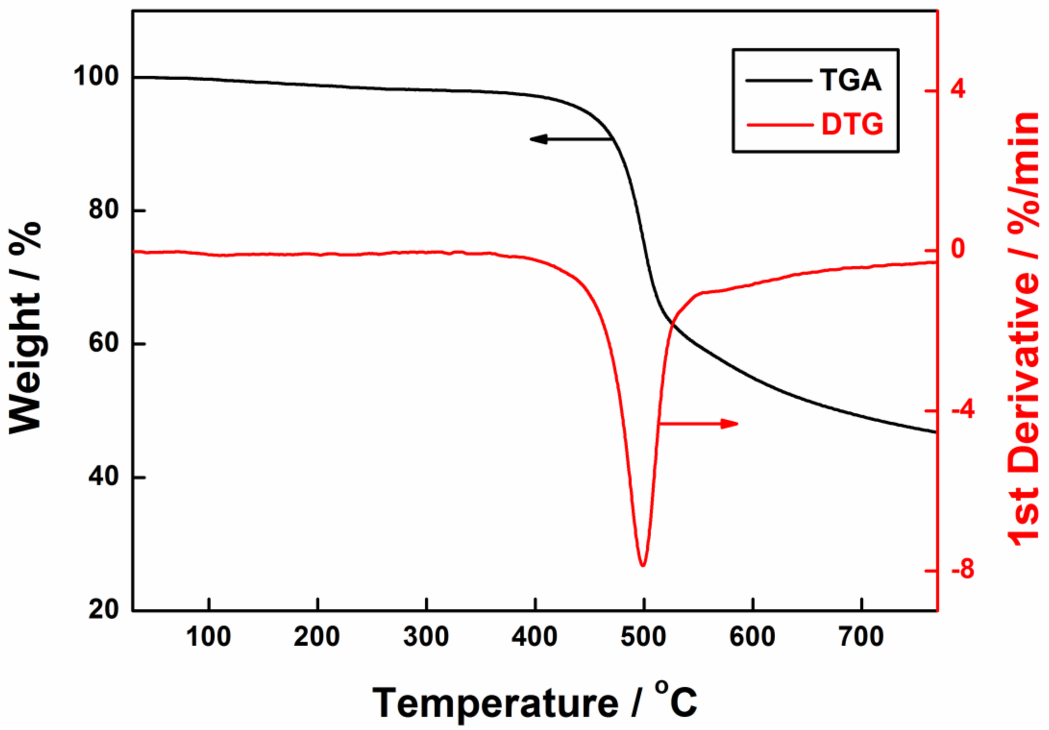

Fig. S4 The TGA and DTG curves of DPDN.

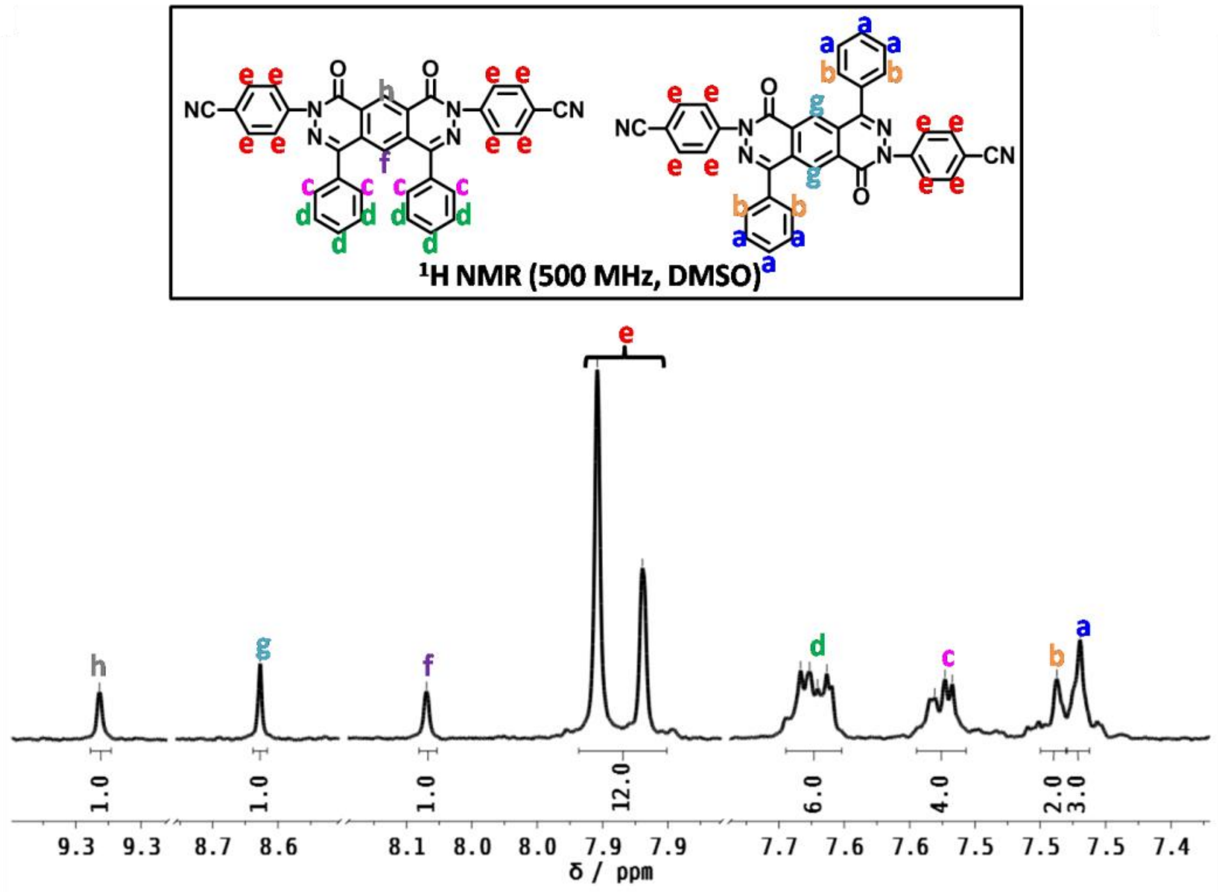

Fig. S5 The [1]H NMR of DPDN.

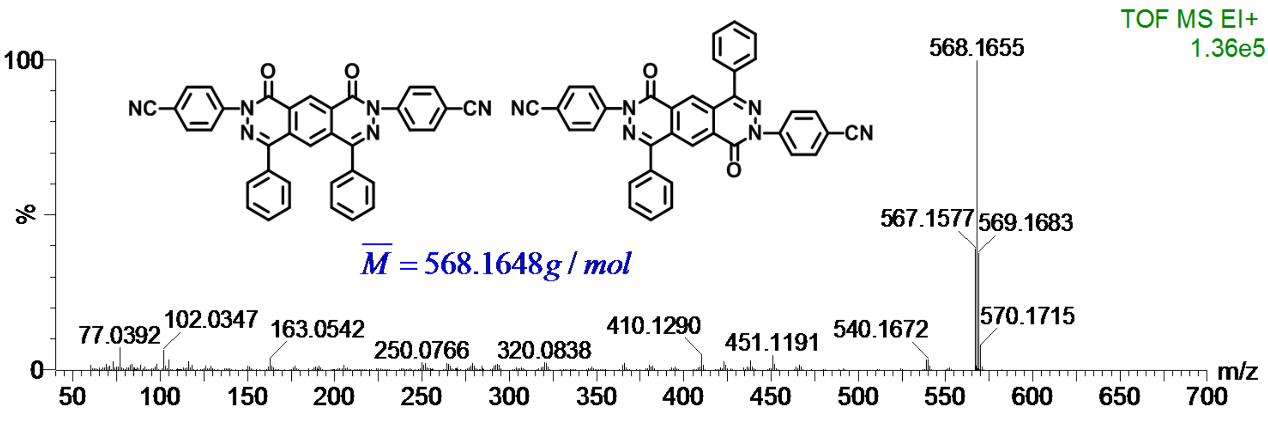

Fig. S6 The mass spectrum of DPDN.

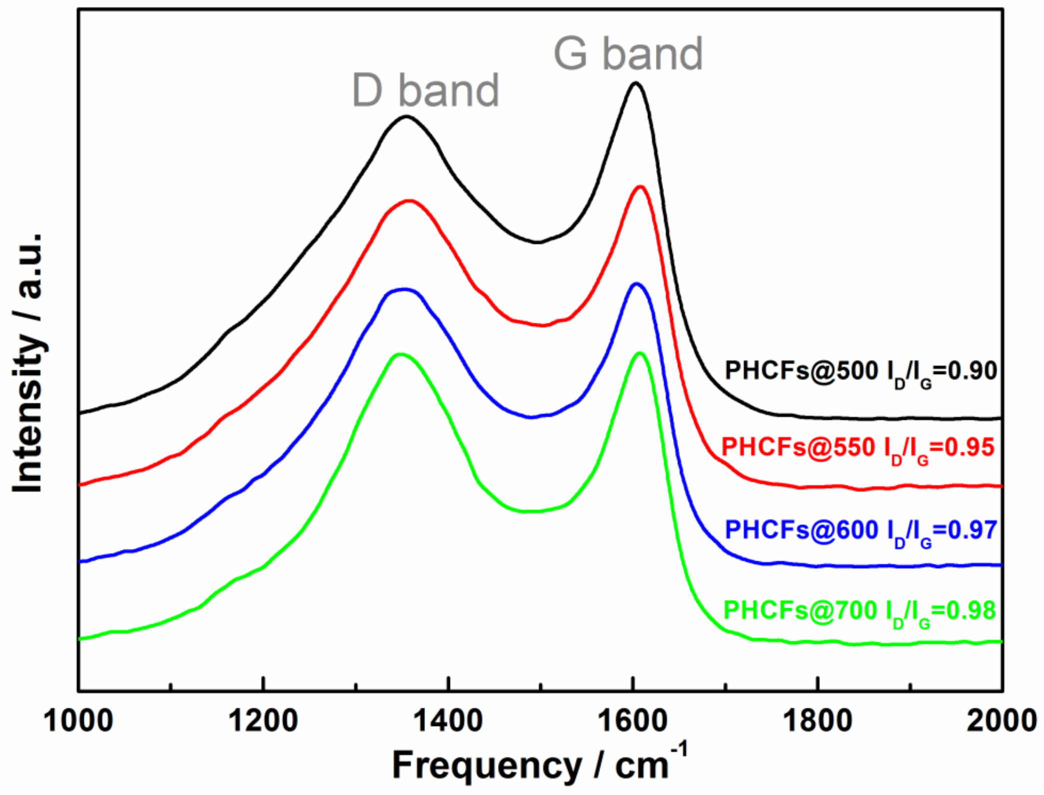

Fig. S7 Raman spectra of PHCFs.

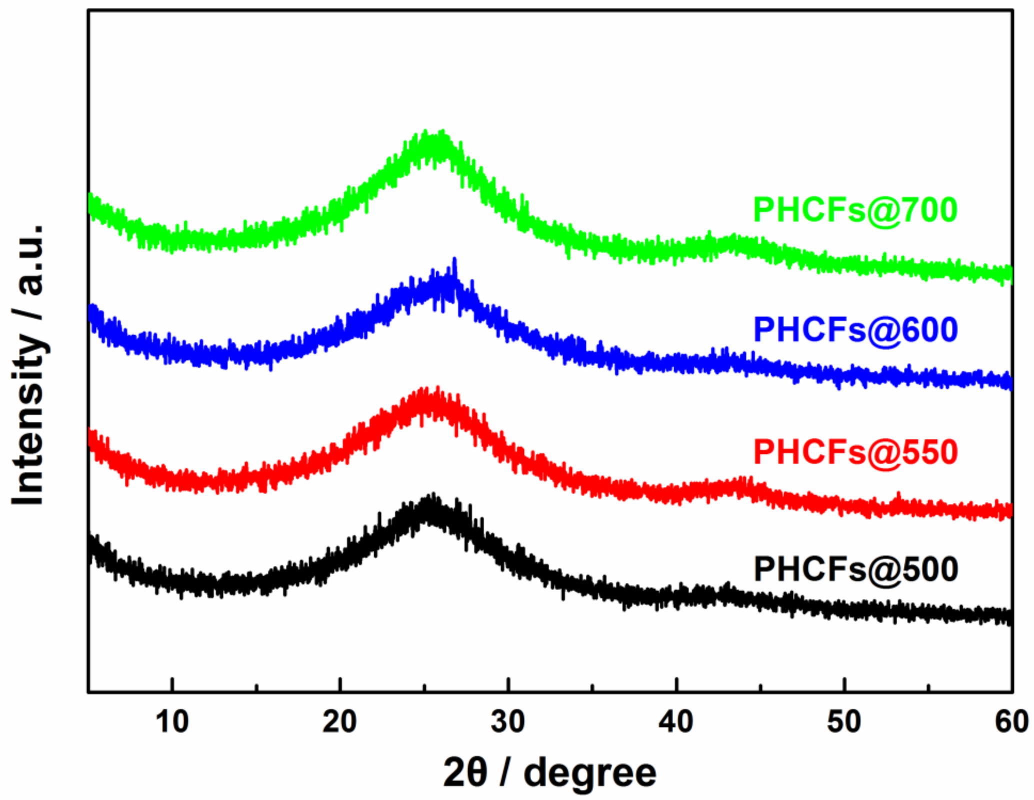

Fig. S8. X-ray diffraction patterns of PHCFs.

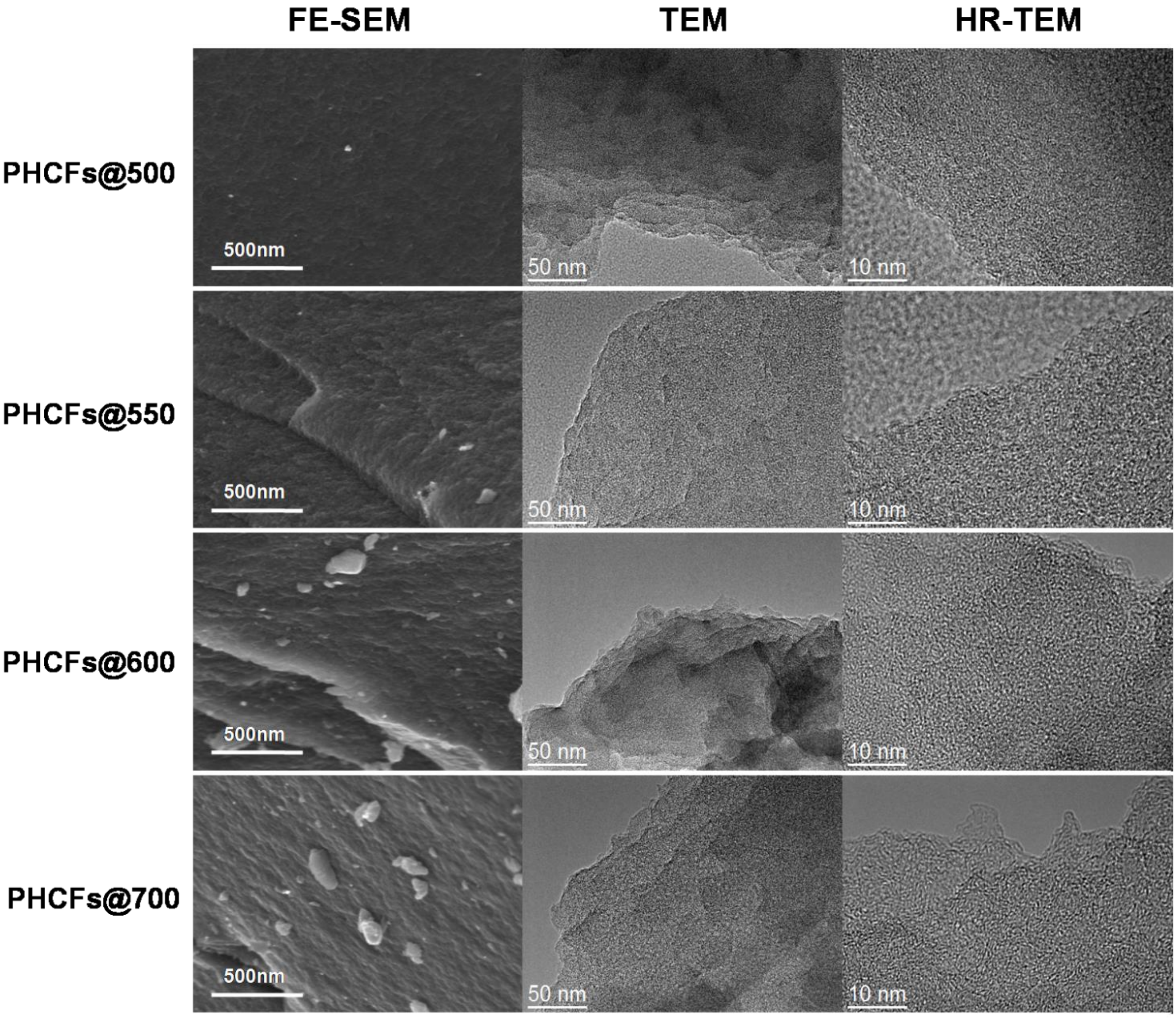

Fig. S9 FE-SEM, TEM and HR-TEM images of PHCFs@500, PHCFs@550, PHCFs@600 and PHCFs@700.

Table S1 Porosity measurement results of PHCFs.

Samples	BET surface area (m^2g^{-1})	Micropore Area (m^2g^{-1})	Average pore size (nm)	Pore volume (m^3g^{-1})
PHCFs@500	1103	767	1.9	0.51
PHCFs@550	1244	650	1.9	0.65
PHCFs@600	1149	684	1.9	0.56
PHCFs@700	1153	635	2.1	0.55

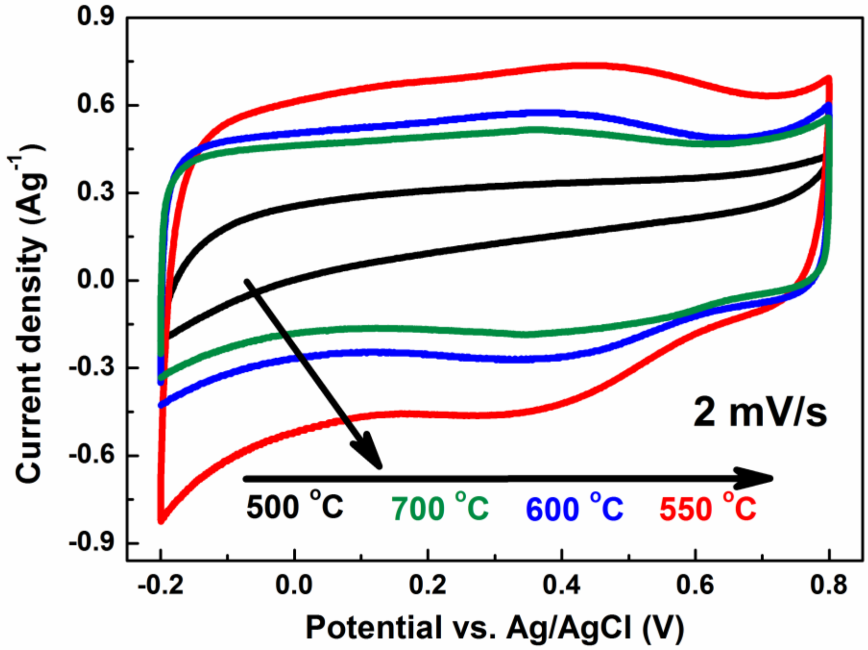

Fig. S10 Cyclic voltammograms of PHCFs electrodes measured in a three-electrode system at 2mV/s.

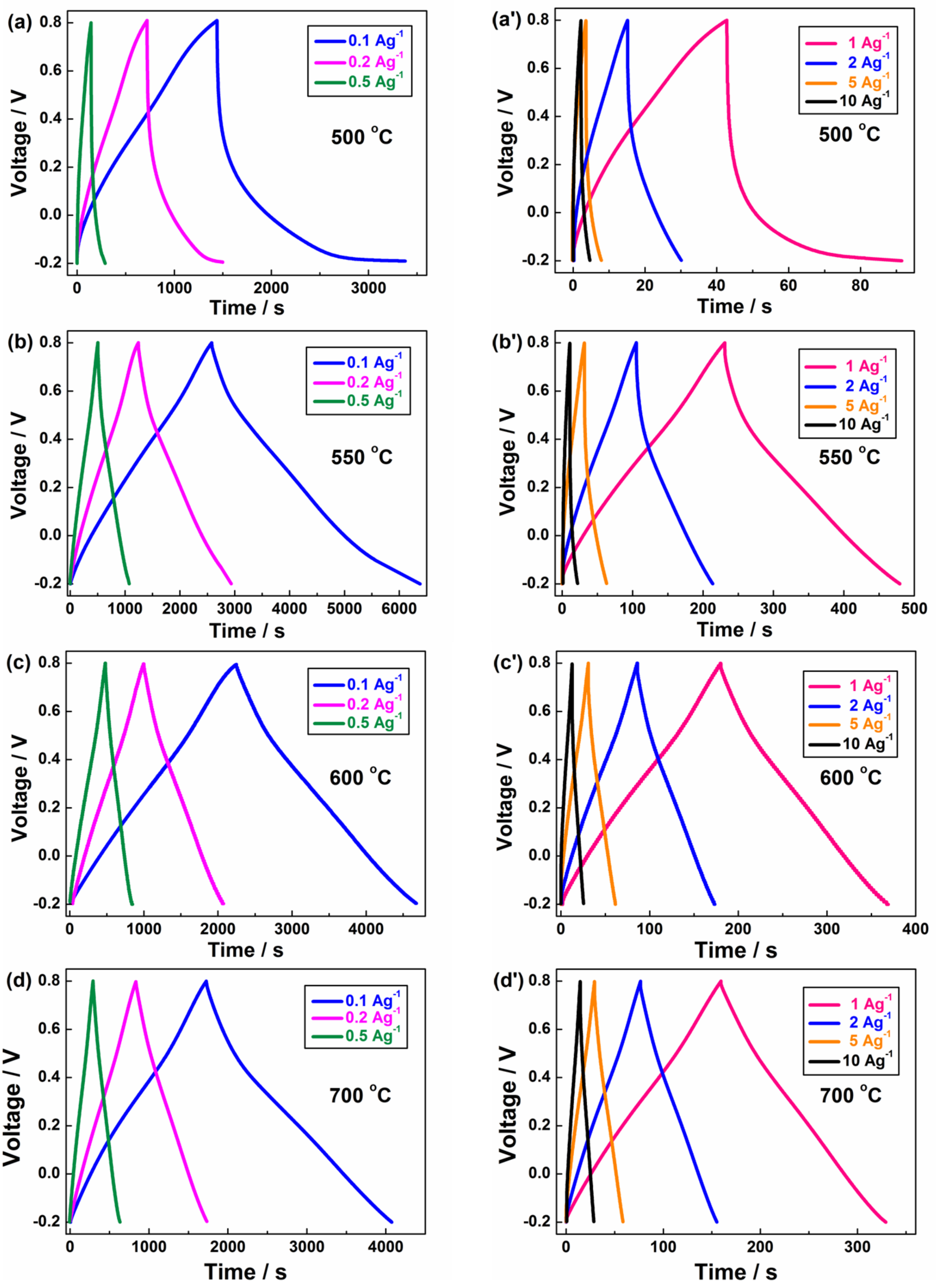

Fig. S11 Galvanostatic charge-discharge curves at different current densities (three-electrode system).

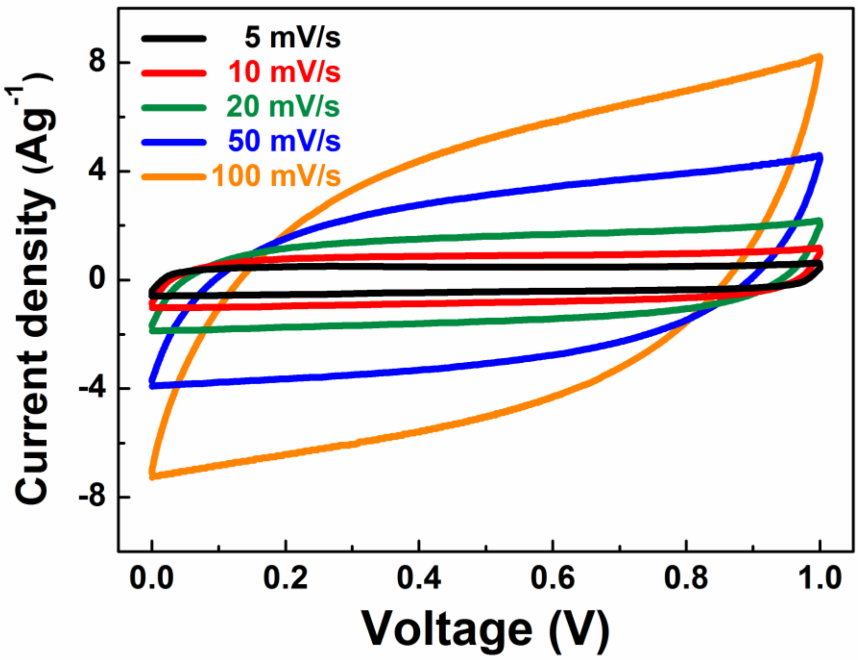

Fig. S12 Cyclic voltammograms of PHCFs@600 electrodes measured in a two-electrode system at different current densities.

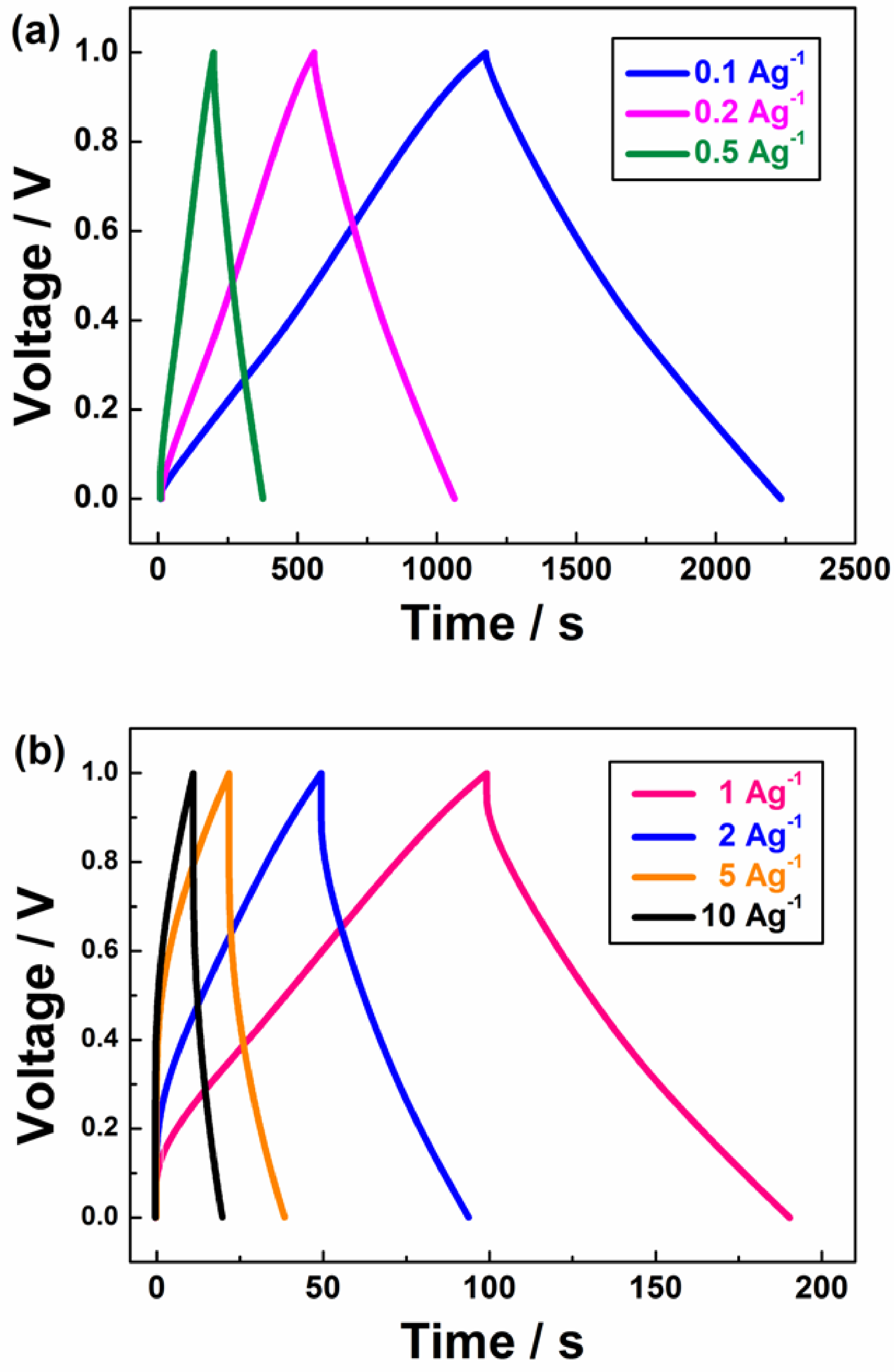

Fig. S13 Galvanostatic charge-discharge curves of PHCFs@600 at different current densities (two-electrode system).

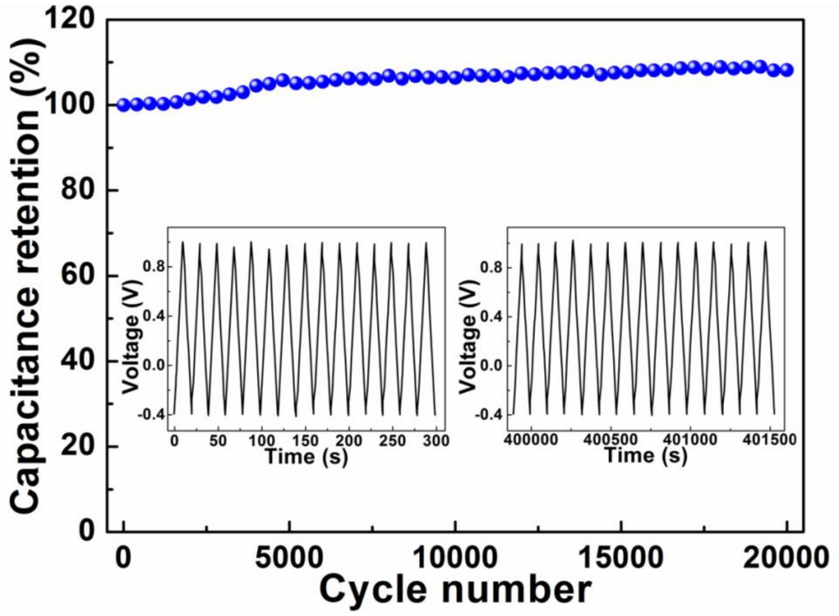

Fig. S14 Cycle life tests with a two-electrode setup at 10.0 A g^{-1}. The first and last fifteen cycles of GC curves are shown in the inset.

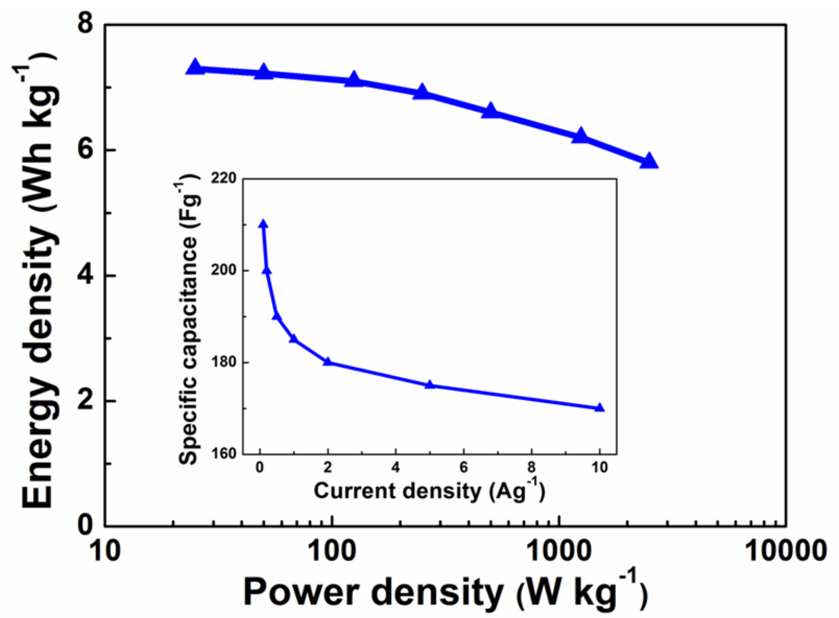

Fig. S15 Ragon plots of PHCFs@600 with specific capacitances inserted.

References

1 Y. Shu, A. S. Hay. *Macromolecules,* 1997, **30**, 2254.

2 Y. Shu, A. S. Hay. *Macromolecules,* 1995, **28**, 2579.