Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supporting Information

Improved electrochemical properties of polypyrrole with cucurbit[6]uril via supramolecular interactions

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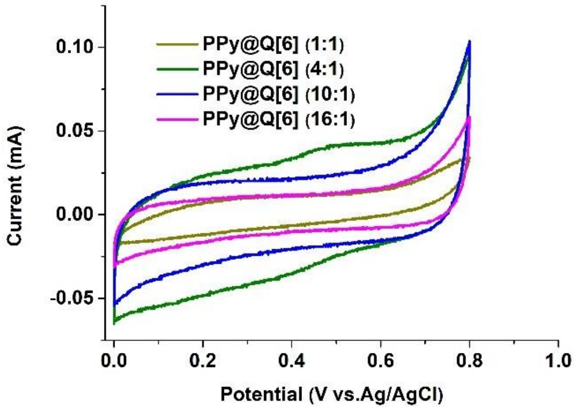

Figure S1 CVs of the composite electrodes at a scan rate of 10 mV s^{-1}.

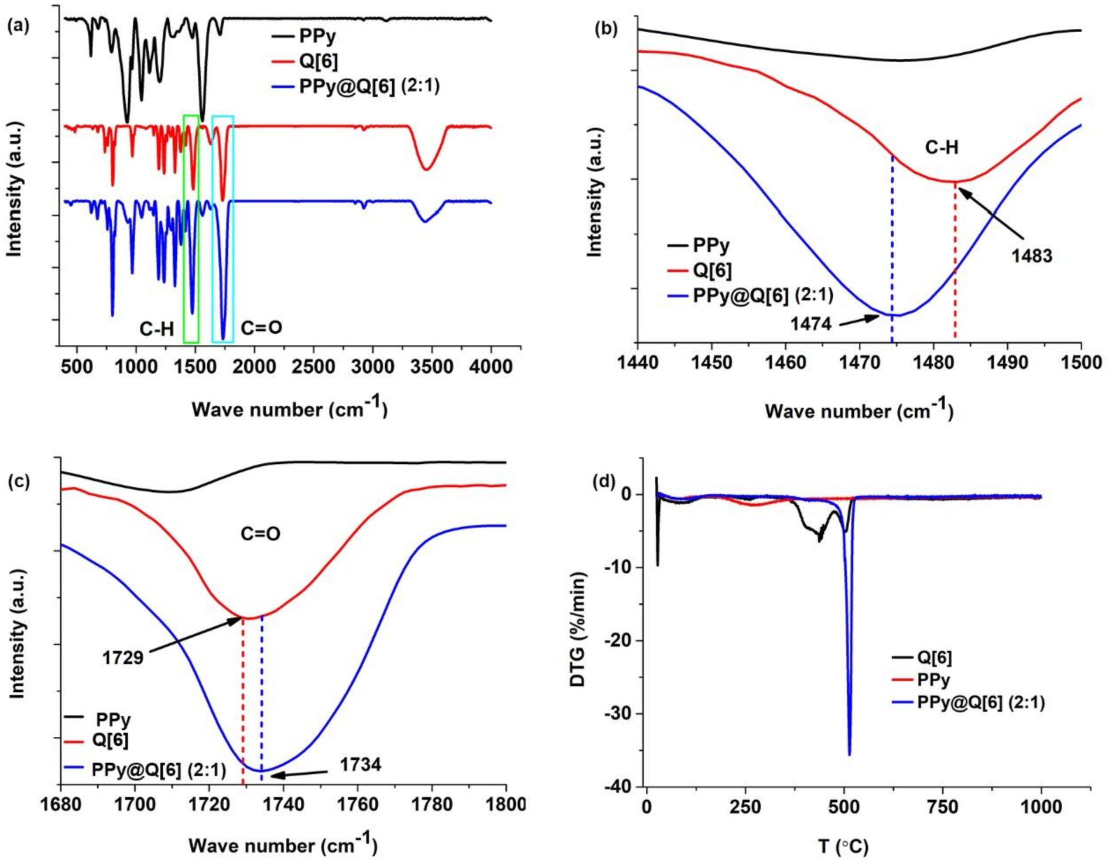

Figure S2 a) FTIR of the composites; b) Magnified FTIR of the composites; c) Magnified FTIR of the composites; d) DTG curves of the composites.

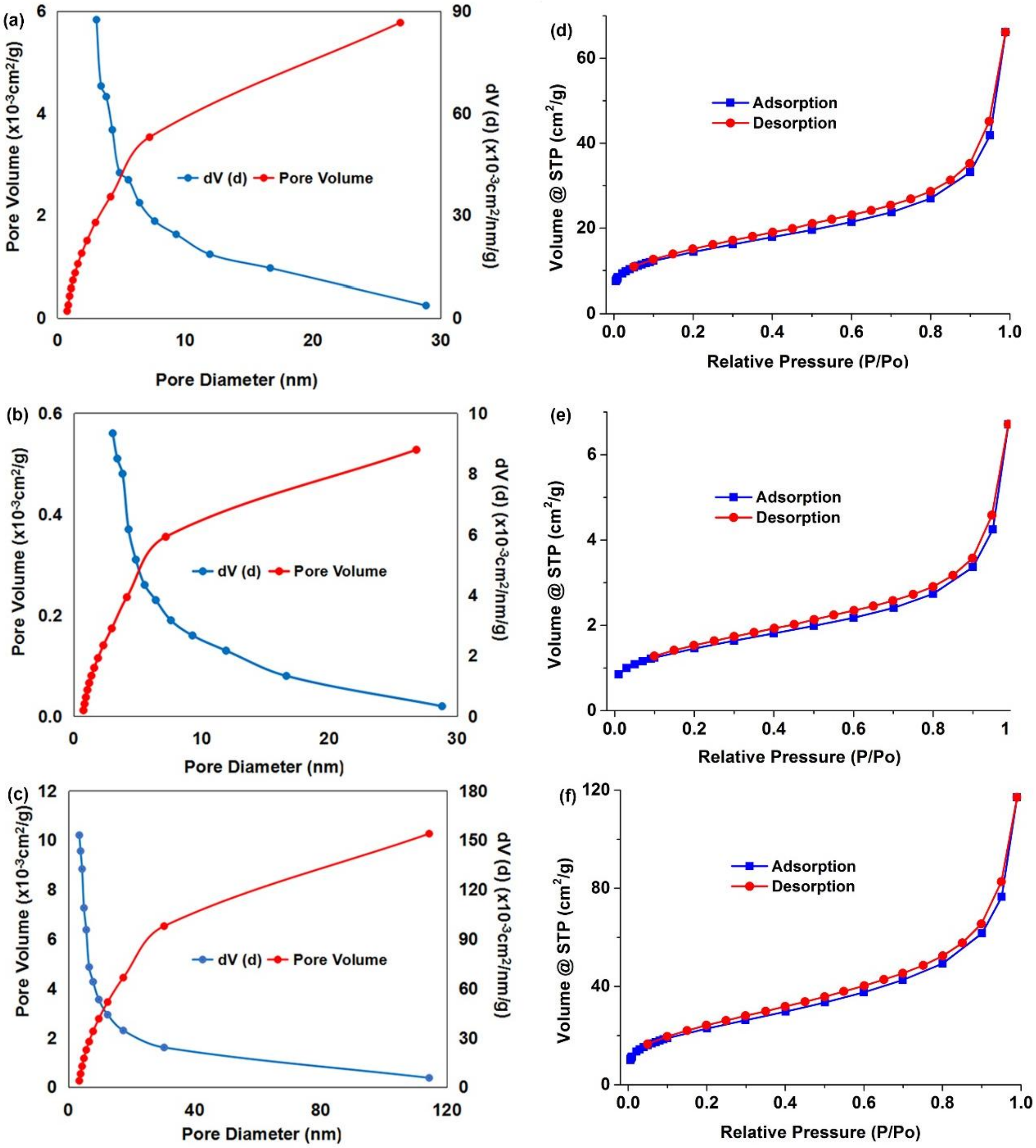

Figure S3 BET of a) PPy; b) Q[6]; c) PPy@Q[6] composites; BJT of d) PPy, e) Q[6], f) PPy@Q[6] (2:1) composites.

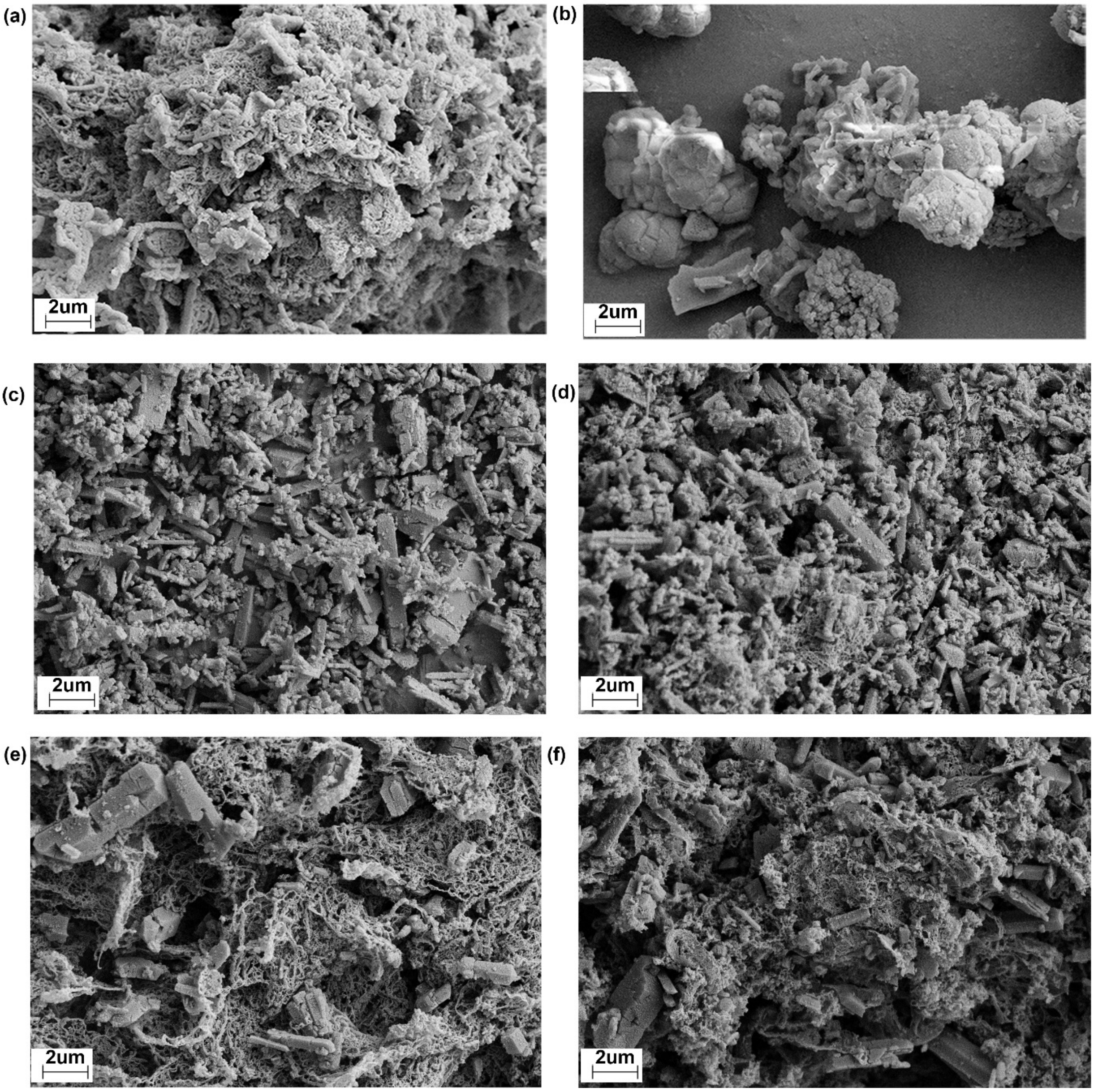

Figure S4 SEM images of a) PPy; b) Q[6]; c) PPy@Q[6] (1:1), d) PPy@Q[6] (4:1), e) PPy@Q[6] (10:1), f) PPy@Q[6] (16:1).

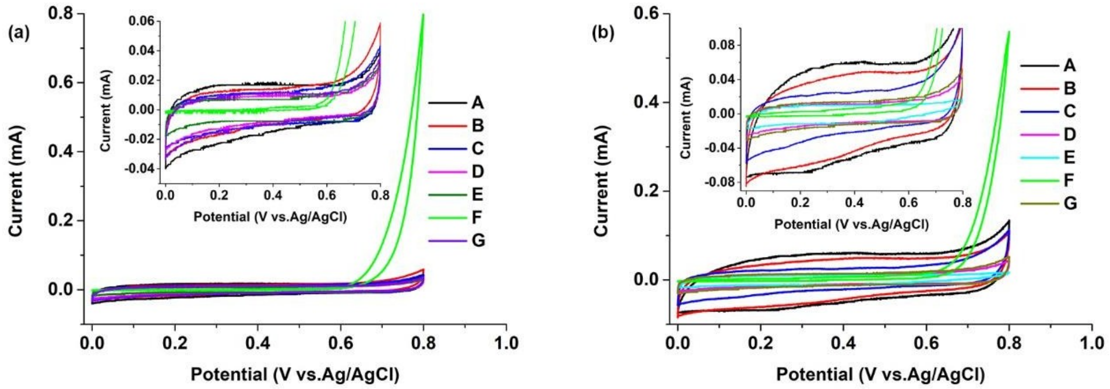

Figure S5 CVs of the PPy (a), PPy@Q[6] (2:1) (b) at a scan rate of 10 mV s^{-1} in different electrolytes, (A. 0.1 KCl and 5.0 M H_2SO_4; B. 0.1 KCl and 1.0 M H_2SO_4; C. 0.1 KCl and 0.1 M H_2SO_4; D. 0.1 KCl and 0.01M H_2SO_4; E. 0.1 KCl；F. 0.1 KCl and 1.0 M NaOH; G. 1.0 M H_2SO_4;).

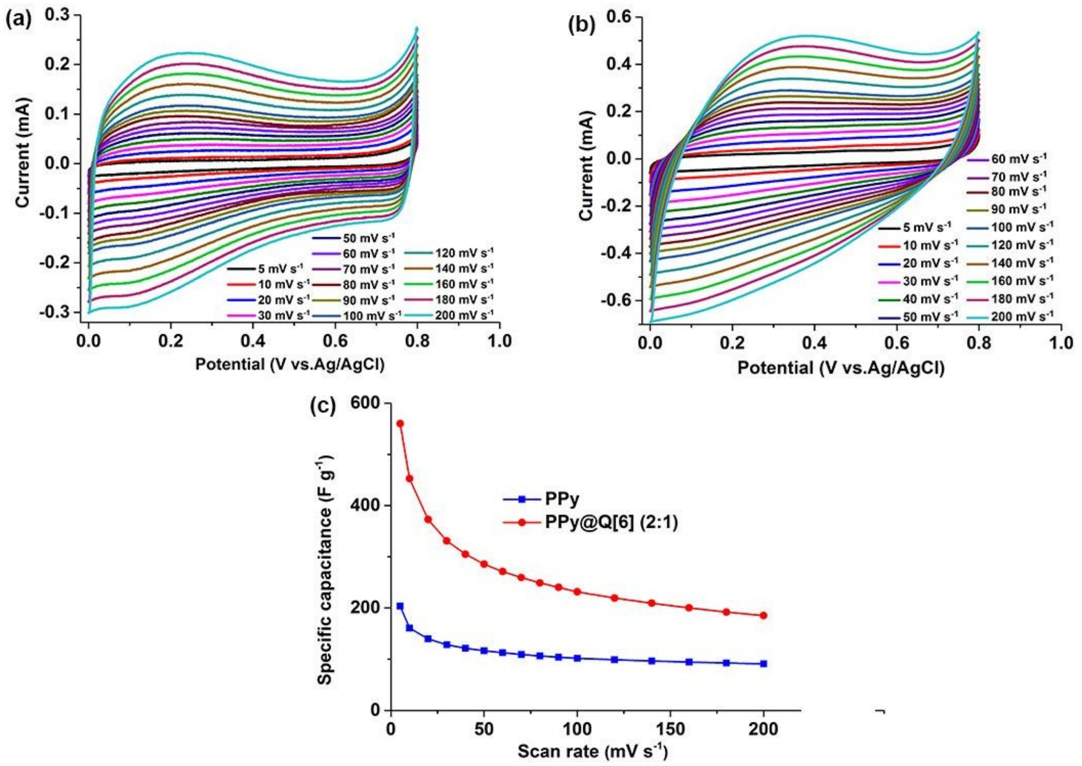

Figure S6 (a) CV curves of PPy at different scan rates; (b) CV curves of PPy@Q[6] (2:1) at different scan rates; (c) specific capacitance values of the two electrodes at different scan rates.

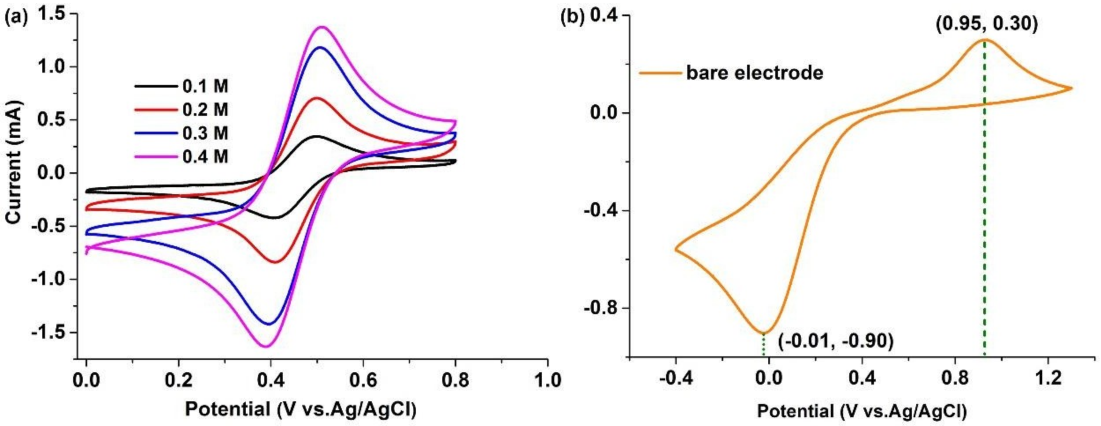

Figure S7 a) CVs of PPy@Q[6] (2:1) composite electrode in electrolytes of 1.0 M H_2SO_4 and 0.1-0.4 M $Fe_2(SO_4)_3$ at a scan rate of 10 mV s^{-1};b) CV of bare electrode in electrolytes of 1.0 M H_2SO_4 and 0.4 M $Fe_2(SO_4)_3$ at a scan rate of 10 mV s^{-1}.

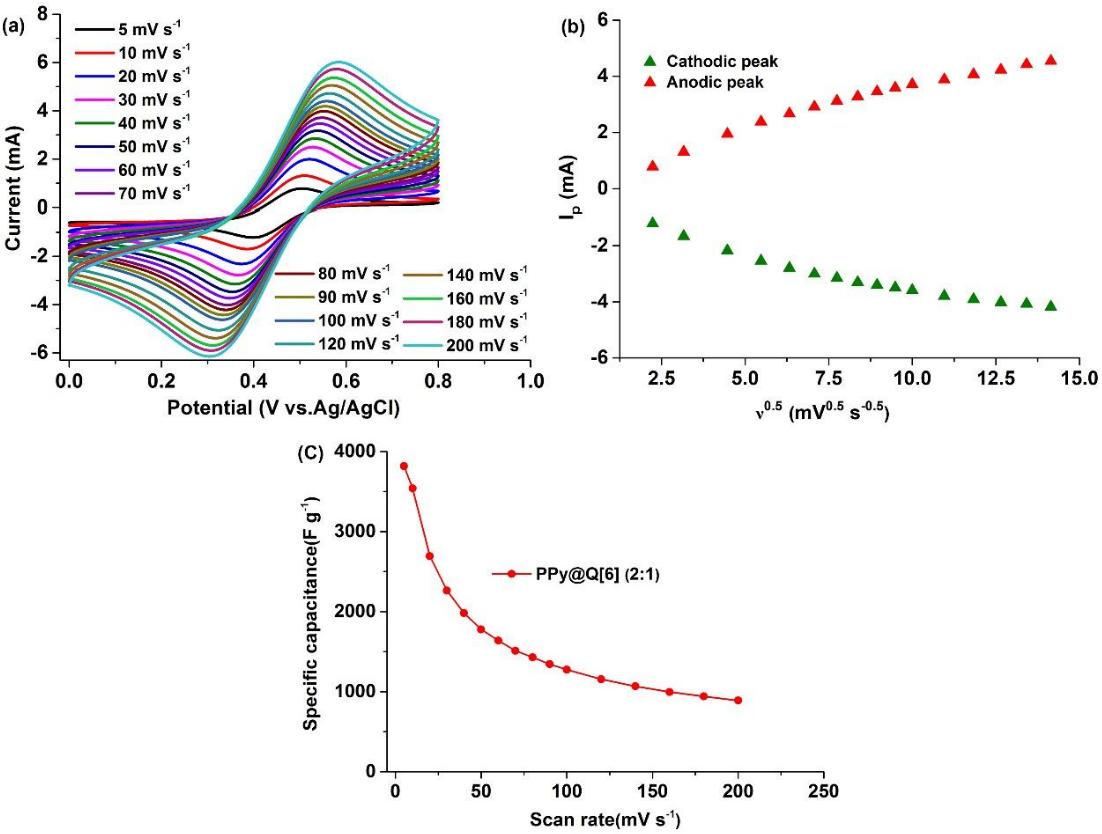

Figure S8 a) CV curves of PPy@Q[6] (2:1) electrode at different scan rates in the mixed electrolytes of 1.0 M H_2SO_4 and 0.4 M $Fe_2(SO_4)_3$; b) dependence of peak current I_p on the square root of scan rate $\upsilon^{0.5}$ for composite electrodes; c) specific capacitance values of PPy@Q[6] (2:1) electrode at different scan rates in the mixed electrolytes of 1.0 M H_2SO_4 and 0.4 M $Fe_2(SO_4)_3$.

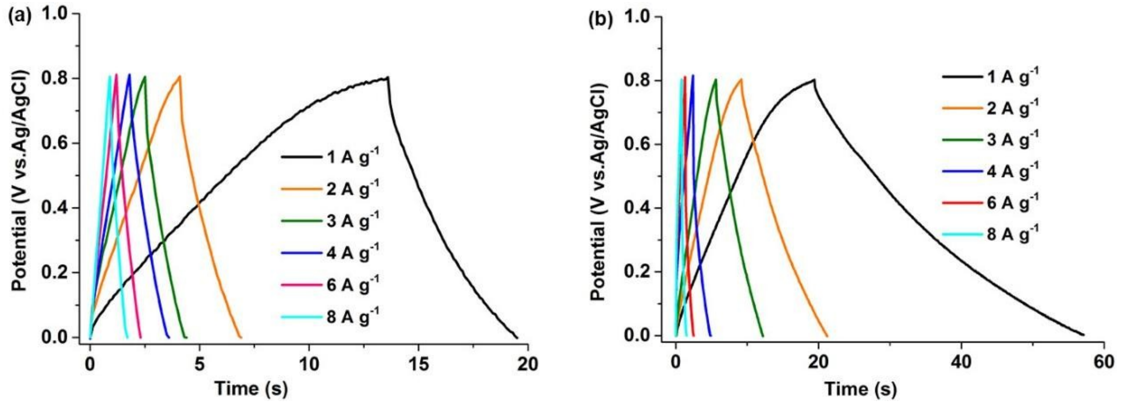

Figure S9 (a) GCD curves of PPy at several current densities; (b) GCD curves of PPy@Q[6] (2:1) at different current densities.

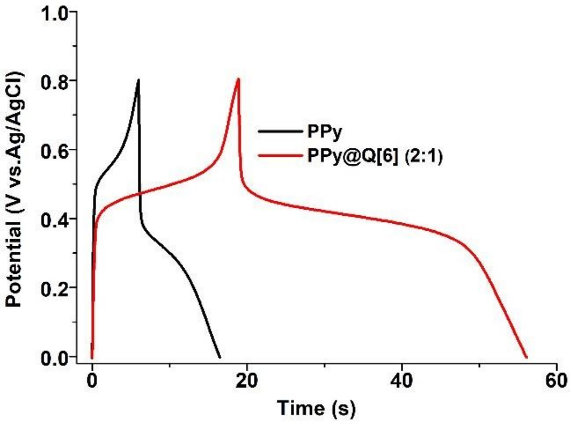

Figure S10 GCD curves at 10 A g^{-1} current density.

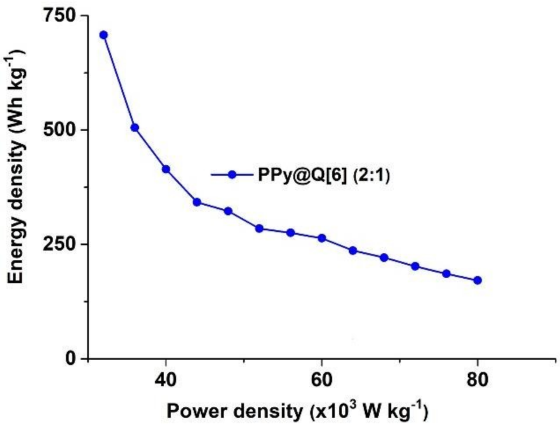

Figure S11 Ragone plots at current densities of 8–20 A g^{-1}.

The derivation of eq (3) and (4) in Experimental section 2.4:

$$E = 1/2 \times C_{sp} V^2 \qquad \text{(S1)}$$

where E (J) represents the energy density, C_{sp} (F g^{-1}) represents the estimated specific capacitance of the ASC device, V (V) is the working potential window.

1W h =3600 J, 1 kg = 1000 g, eq (S1) could be given as:

$$E = 1/2 \times C_{sp} \times \mathrm{V}^2 \times (1/3600) \times 1000 \qquad \text{(S2)}$$

$$E = 1/(2 \times 3.6)\, C_{sp}\, \mathrm{V}^2 \qquad \text{(S3)}$$

where E (W h kg^{-1}) represents the energy density, C_{sp} (F g^{-1}) represents the estimated specific capacitance of the ASC device, V (V) is the working potential window.

$$P = E/\Delta t \qquad \text{(S4)}$$

where E (W s kg^{-1}) represents the energy density, P (W kg^{-1}) represents the power density, Δt (s) is the discharging time as obtained from the GCD profiles.

1 h = 3600 s, therefore, eq (S4) could be described to be

$$P = 3600\, E/\Delta t \qquad \text{(S5)}$$

where E (W h kg^{-1}) represents the energy density, P (W kg^{-1}) represents the power density, Δt (s) is the discharging time as obtained from the GCD profiles.