Electronic Supplementary Information for

All-solid-state asymmetric supercapacitor based on reduced graphene oxide/carbon nanotube and carbon fiber paper/polypyrrole electrodes

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Experimental section

Methylene blue technique for specific surface area measurement

Methylene blue (MB) is a common dye probe used to evaluate the specific surface area (SSA). The specific surface area was measured using MB adsorption method by UV-vis spectroscopy. The test was taken by first adding a known mass of sample into a known volume MB solution of standard concentration. The mixed suspension was then sonicated for 2 h and stirred continuously for 24 h to reach the adsorption-desorption equilibrium of MB. The mixture was further centrifuged to remove any suspended material. The MB concentration was subsequently determined by analyzing the supernatant through UV-vis spectroscopy at a wavelength of 665 nm compared with the initial standard concentration. The value of specific surface area can be calculated from the amount of adsorbed MB according to the following equation:
\[ SSA = \frac{N_A A_{MB} (C_0 - C_e) V}{M_{MB} m_S} \]

where \( N_A \) is Avogadro number (6.02\times10^{23}/\text{mol}), \( A_{MB} \) is the covered area of per MB molecule (typically assumed to be 1.35 nm\(^2\)), \( C_0 \) and \( C_e \) are the initial and equilibrium concentrations of MB, respectively, \( V \) is the volume of MB solution, \( M_{MB} \) is the relative molecular mass of MB, and \( m_S \) is the mass of the sample.

**Results and discussion**

![Graph showing specific capacitance and specific surface area as a function of GO/cMWCNT weight ratio.](image1.png)

**Fig. S1** Influence of GO/cMWCNT weight ratio on the specific capacitance and the specific surface area of RGO/cMWCNT.

![FE-SEM image of CFP/PPy-1200s film with high magnification.](image2.png)

**Fig. S2** FE-SEM image of CFP/PPy-1200s film with high magnification.
Fig. S3 Specific capacitance of CFP/PPy-900s and CFP/PPy-1200s as a function of current densities.

Fig. S4 Cyclic voltammetry curves of CFP/PPy//RGO/cMWCNT ASC at normal and twisted states.

References

