

Supporting Information

Carbon microspheres with tailored texture and surface chemistry as electrode materials for supercapacitors

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Experimental details

Gravimetric capacitances, C (F/g), were obtained from the cyclic voltammetry curves by Eq. S1:^{1,2}

$$C = \frac{\sum |I| \times \Delta t}{m \times \Delta V} \quad (\text{Eq. S1})$$

S1)

where $\sum |I| \times \Delta t$ was the area of the current (A) against time (s) curve, Δt the discharge time, m the total mass of the carbon material in the electrodes, ΔV the voltage interval after the ohmic drop.

The gravimetric capacitance, C (F/g), was obtained from galvanostatic charge-discharge tests by Eq. S2:^{3,4}

$$C = \frac{I_d \times \Delta t}{m \times \Delta V} \quad (\text{Eq. S2})$$

where I_d is the discharge current, Δt the discharge time, m the total mass of the active material in the electrodes, and ΔV the voltage interval after the ohmic drop.

For performance comparisons, the gravimetric capacitances in two-electrodes configuration (2EC) were multiplied by four to obtain the expression per single electrode, (C_{CV} and C_{GD} , from cyclic voltammetry and galvanostatic charge-discharge tests, respectively) which is the 3-electrode configuration (3EC) equivalent.⁵

The electrical energy and the power density were calculated by using the Eq. S3 and Eq. S4, respectively for two-electrode cell:⁶

$$E(Wh\ kg^{-1}) = \frac{C(F\ g^{-1}) \times \Delta V^2(V)}{2 \times 3.6} \quad (\text{Eq. S3})$$

S3)

$$P(W \text{ kg}^{-1}) = \frac{E}{\Delta t} \quad (\text{Eq. S4})$$

where ΔV is the operation voltage taken as $\Delta V = V_{\text{max}} - IR_{\text{drop}}$, Δt is the discharge time

(h) and C are the values of the capacitances obtained from Eq. S2.

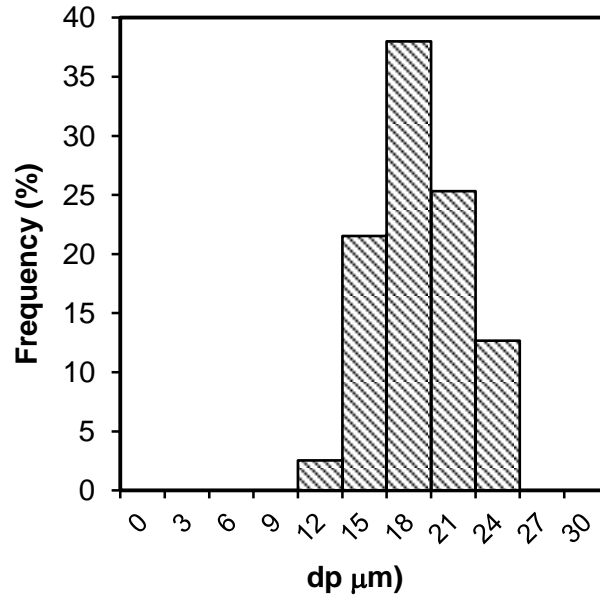


Figure S1. Particle size distribution of carbon microspheres obtained from the analysis of optical microscopy images.

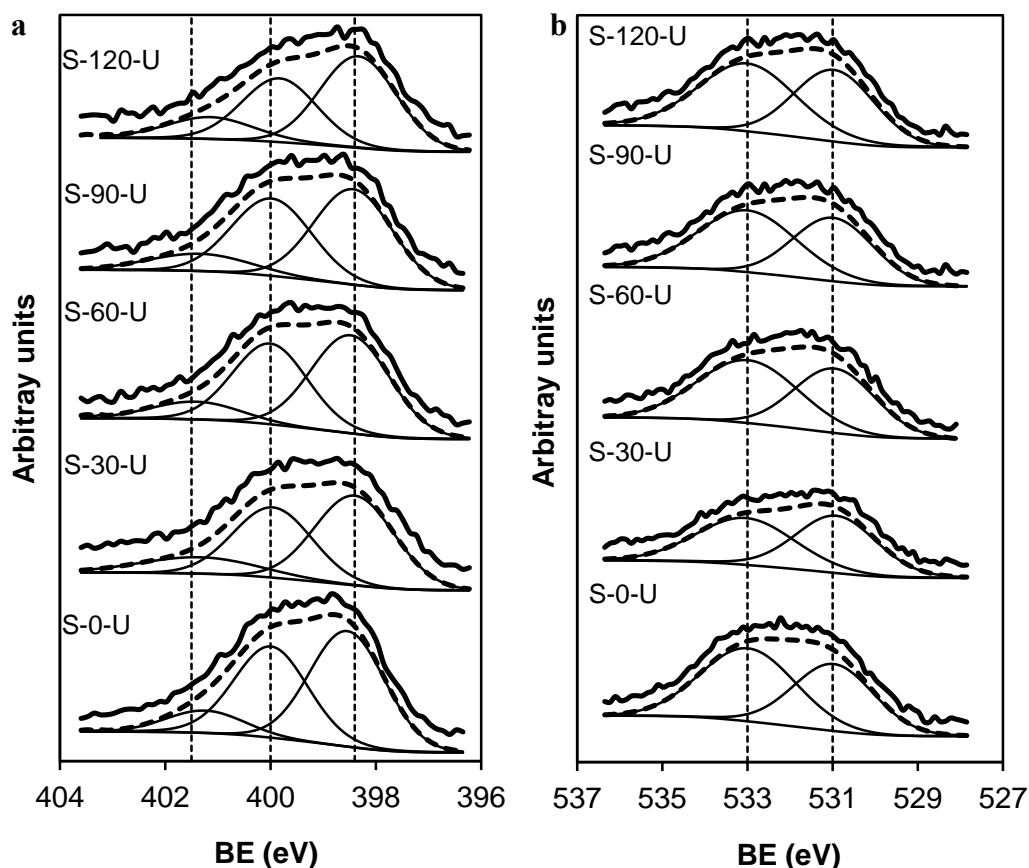


Figure S2. XPS spectra of urea-treated carbon microspheres: (a) N_{1s} and (b) O_{1s}

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