Supporting Information

Sulfur-Doped Porous Carbon via Thermal Reduction of CS_2 by Mg for High-Performance Supercapacitor Electrodes and Li-Ion Battery Anodes

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1. Capacitance calculation

The gravimetric specific capacitances (C_g) was calculated using galvanostatic CD curves, according to the following equation:

$$C_g = (I\Delta t)/(\Delta V)$$

where I is the current density (A g^{-1}), Δt is the time for a full discharge, ΔV is the potential window.

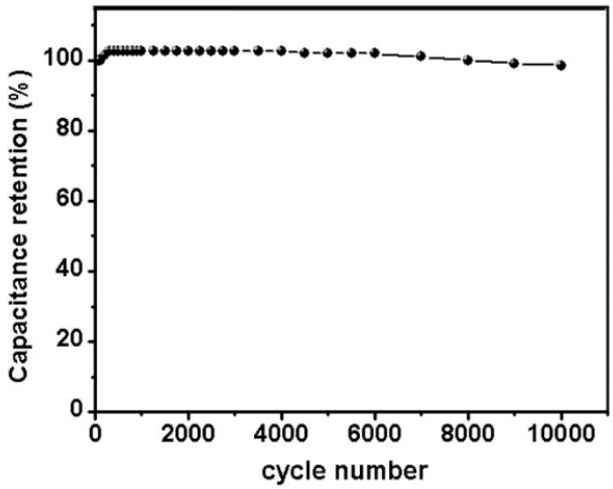

Fig. S1. The variation of capacitance retention of the supercapacitor electrode after running GCD at 5 A g^{-1} for different cycles.

2. Morphologies of S620 and S750 samples

Figures S2a and **S2**b show low- and high-magnification SEM images of the S620 carbon powder. When exposed to CS_2 at high temperature, the Mg grain was converted into carbon layers of shells, each about few hundreds of nm in thickness and has fluffy carbon sheets in outer surface, as shown in **Fig. S2**b. SEM images in **Figs. S2**c and **S2**d were taken from the S750 sample. An interesting core-shell structure is unveiled by the broken ball with diameter in micrometre scale. Nevertheless, nanopores can be clearly

seen from the cross-sections of the 'egg' shell in **Fig. S2**d and the hull in **Fig. S2**c, confirming the mesoporous structure of our carbon product.

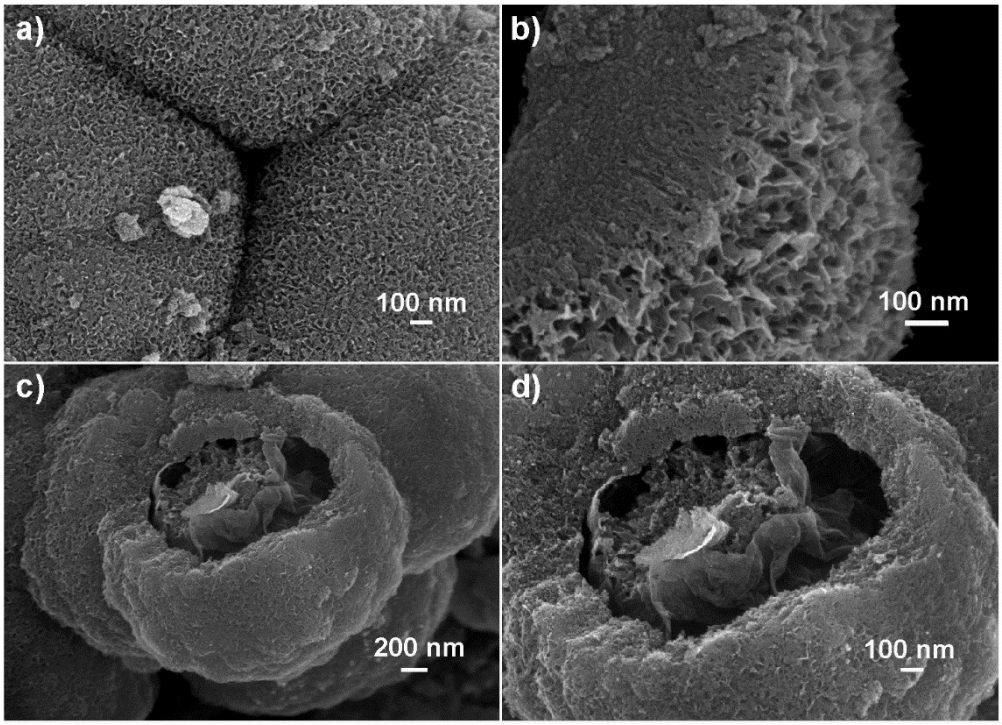

Fig. S2. SEM images of (a, b) S620 and (c, d) S750 samples. The mesoporous feature can be found from the cross-sections of carbon shells in (b) and (d).

Figure S3 shows TEM images of S750 and S680 samples. Carbon sheets are rumpled and their surfaces are not as smooth as graphene. From the high-resolution image in **Figs. S3**b and **S3**d, nanoholes can be seen, as highlighted by dashed circle lines.

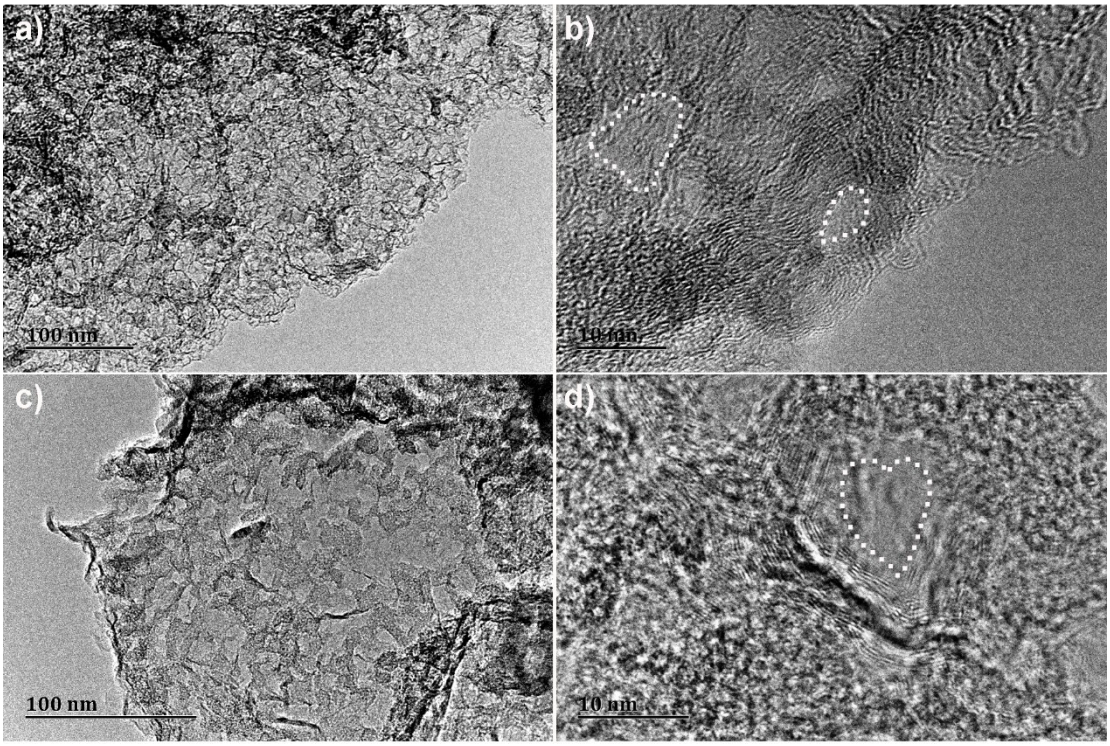

Fig. S3. Low- and high-resolution TEM images of the (a,b) S750 and (c,d) S680 samples. Nanoholes are marked by dashed-line circles.