Supplementary Information

Excellent supercapacitance performance of 3D mesoporous carbon with large pores from FDU-12 prepared by microwave method

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Characterization

The morphology of the samples was determined by HR-SEM (JEOL JSM 6610) operating at an acceleration voltage of 15kV and the working distance of 8 mm. HR-TEM images of the samples are obtained from JEOL JEM-2000EX2 operating at an acceleration voltage of 200 kV. The powder X-ray diffraction (XRD) pattern measurements were recorded on a Rigaku diffractometer equipped with Cu kα radiation (λ=0.154 nm), The diffraction peaks were recorded by selecting 20 range from 0.3° to 5° with a step size of 0.01 per second. The nitrogen adsorption and desorption measurements were carried out on a Micromeritics ASAP2420. Before the analysis, all the samples were degassed for 6 h at 200 °C. The specific surface area of each material was calculated by using the Brunauer – Emmett – Teller (BET) analysis whereas the pore size distribution was obtained according to the Non-Local Density Functional Theory (NLDFT) method. Electrochemical measurements such as cyclic voltammetry (CV) and chronopotentiometry were carried out for the charging-discharging characteristics on a CHI 760C electrochemical workstation, and an impedance spectroscopy measurement was investigated on a ZIVE mp2 electrochemical workstation. The electrochemical measurements of all the samples were carried out in 2 M KOH aqueous electrolyte solution with a standard three-electrode cell. Ag/AgCl and Pt were used as a reference and counter electrode respectively. For the electrochemical measurement, electrode materials were prepared by mixing 90 wt % of MCF-M-T materials (1 mg) and 10 wt % of polyvinylidene fluoride (PVDF) in isopropanol. The slurry was coated onto a nickel foam and the nickel foam was pressed, and dried at 100 °C in the vacuum oven overnight. The CV and chronopotentiometry measurements were carried out in a potential range from -0.6 V to 0.2 V at different scanning rates and current densities. The impedance spectroscopy measurement was carried out using frequency range between 1 MHz and 1 mHz with an amplitude of 0.005 V. In addition, the capacitive performance of MCF-M-150 was further studied using a 2032 two-electrode standard coin cell. The working electrode was prepared by thoroughly mixing with active material of 80 wt%, conductive support of 10 wt% and binder (poly acrylic acid and carboxymethyl cellulose, ratio 5:5) of 10 wt% in ethanol. The slurry was spread onto a copper sheet and completely dried in the vacuum oven overnight. The coin cell was assembled with 1M Na2SO4 as electrolyte and thin polypropylene film as separator. The capacitance was calculated using the equation; C =2(IΔt/mΔV), where I is current (A), Δt is the discharging time in (s), ΔV is the range of voltage in (Volts), and m is the weight of the active materials in (g).
Figure S1: Powder XRD patterns of FDU-12-M-T synthesized by microwave irradiation
**Figure S2:** SEM images of FDU-12-M-T samples synthesized by microwave irradiation
Figure S3: HR-SEM images of MCF-M-T samples synthesized by using FDU-12-M materials by carbonization at 900 °C for 6h
Figure S4: HRTEM images of FDU-12-M-150
Figure S5: HRTEM images of FDU-12-M-200 sample
Figure S6: Nitrogen absorption desorption isotherms of FDU-12-M-T
Figure S7: CV profiles of the MCF-M-T samples at scanning rate of 100 mVs$^{-1}$
Figure S8: (a) CV profiles of symmetric capacitor of MCF-M-150 at different scanning rate; (b) Charge-discharge profile of symmetric capacitor of MCF-M-150 at current density of 0.15 A g⁻¹.
Table 1S: Comparison of specific capacitance in supercapacitors using carbon based materials showing EDLC behaviour.

| Materials                  | Specific surface area | Specific capacitance | Current density | Electrolyte | Reference |
|----------------------------|-----------------------|----------------------|-----------------|-------------|-----------|
| Porous carbon              | 2339 m² g⁻¹           | 218 F g⁻¹            | 0.1 A g⁻¹       | 6M KOH      | 1         |
| MWCNT                      | 250 m² g⁻¹            | 22 F g⁻¹             | 1 mA cm⁻²       | 2M H₂SO₄    | 2         |
| Activated carbon           | 747 m² g⁻¹            | 55 F g⁻¹             | 1 mA cm⁻²       | 2M H₂SO₄    | 2         |
| Mesoporous carbon CMK-3    | 1350 m² g⁻¹           | 186 F g⁻¹            | 1 mA cm⁻²       | 2M H₂SO₄    | 2         |
| Mesoporous carbon CMK-8    | 1321 m² g⁻¹           | 176 F g⁻¹            | 0.625 A g⁻¹     | 2M KOH      | 3         |
| MCF-M-150                  | 1251.5 m² g⁻¹         | 315.3 F g⁻¹          | 1 A g⁻¹         | 2M KOH      | Current work |

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