Supplementary Materials

Dual-Template Synthesis of Ordered Mesoporous Carbon/Fe_2O_3 Nanowires: High Porosity and Structural Stability for Supercapacitors

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Calculations

1. The mesopore volume difference between OMC/Fe_2O_3 composites and their corresponding OMCs (ΔV_{meso} %) is calculated by Equation S1:

$$\Delta V_{meso}\% = \frac{V_{meso-C} - V_{meso-CFe} / (1 - Fe_2O_3\,\%)}{V_{meso-C}} \times 100 \quad \text{(S1)}$$

where V_{meso-C} is the mesopore volume of the original OMC, $V_{meso-CFe}$ is mesopore volume of OMC/Fe_2O_3 composite, and Fe_2O_3 % is the mass percentage of Fe_2O_3 in the OMC/Fe_2O_3, so that $V_{meso-CFe} / (1 - Fe_2O_3\,\%)$ is the mesopore volume of OMC/Fe_2O_3 composite normalized by carbon mass.

2. All specific capacitance values were obtained using the data from the cyclic voltammetry (CV) curves through the following equation (the capacitance of Ni current collector has been subtracted):

$$C_{sp} = \frac{\int_{-0.8}^{0} IdV + \int_{0}^{-0.8} IdV}{2 \times 0.8 \times \upsilon \times mass}$$

(S2)

where I is the current, V is the voltage vs. Ag/AgCl, 0.8 V is the voltage window, υ is the scan rate, and *mass* is the mass of the mesoporous material.

Figures & Tables

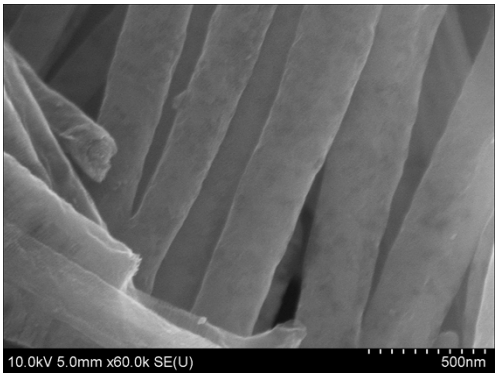

Figure S1 High resolution SEM of OMCNW/Fe_2O_3.

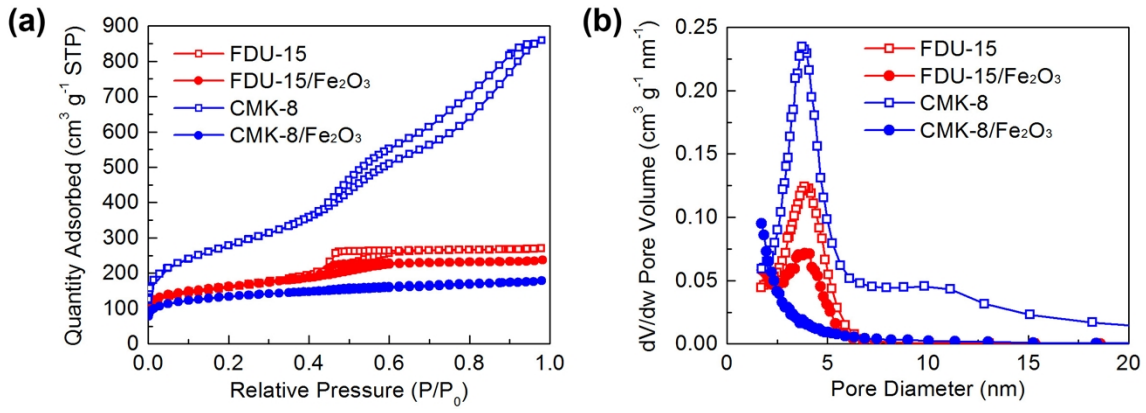

Figure S2 N_2 adsorption-desorption isotherms (a) and pore size distributions (b) of FDU-15, CMK-8, and their derived OMC/Fe_2O_3 composites.

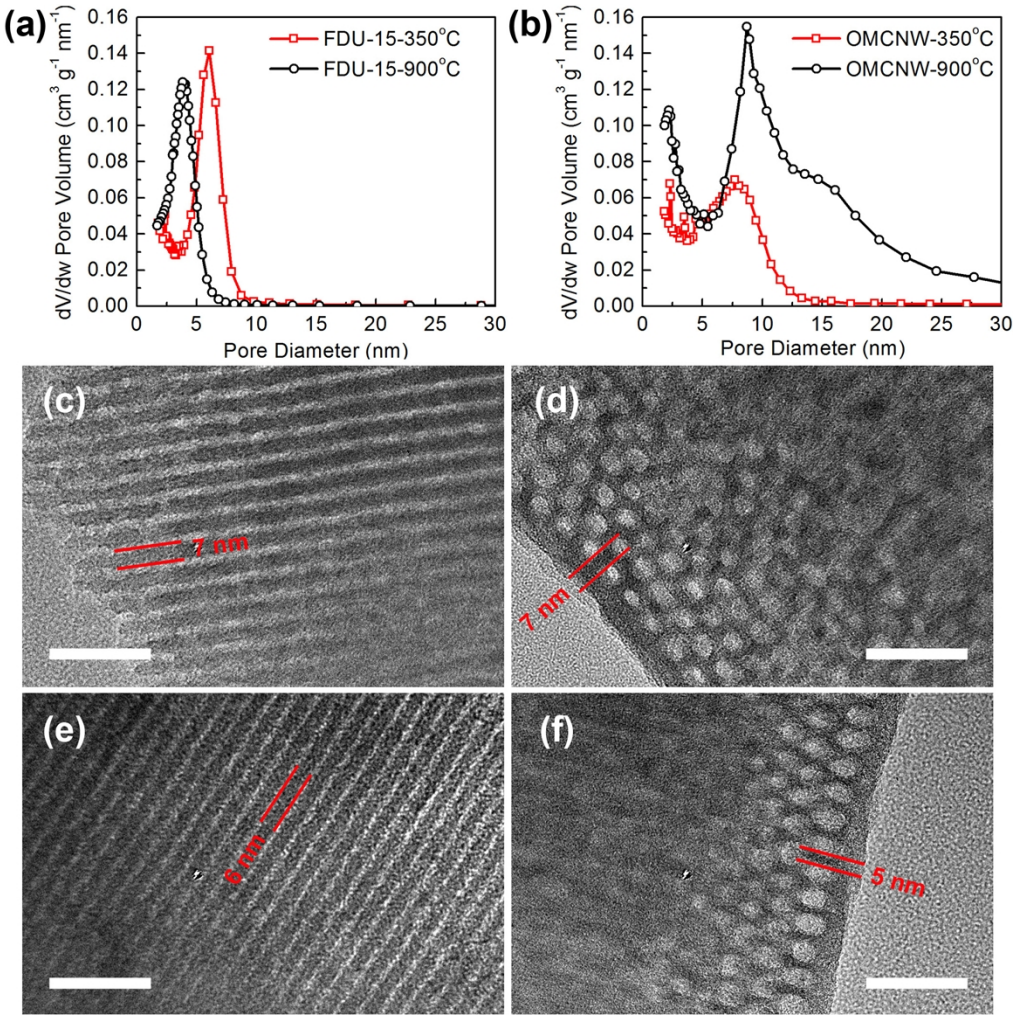

Figure S3 (a, b) Pore size distribution of (a) FDU-15, and (b) OMCNW annealed at different temperatures. (c-f) High-resolution TEM (HRTEM) of (c) FDU-15 annealed at 350 °C, (d) OMCNW annealed at 350 °C, (e) FDU-15 annealed at 900 °C, (f) OMCNW annealed at 900 °C, all scale bars are 50 nm, the red labels indicate the mesopore wall thickness.

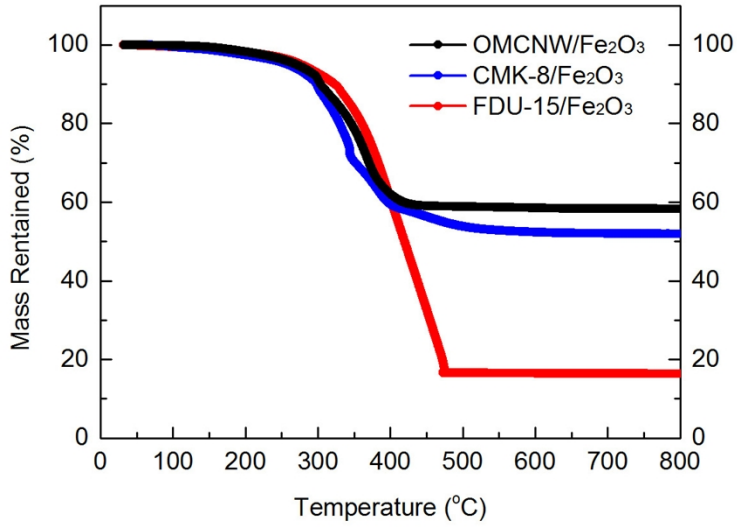

Figure S4 TGA curves of FDU-15/Fe_2O_3 (16.4 wt%), CMK-8/Fe_2O_3 (51.9 wt%), and OMCNW/Fe_2O_3 (58.3 wt%).

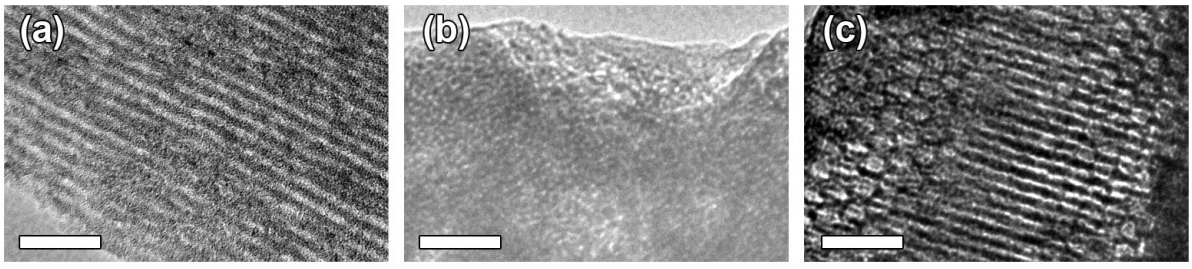

Figure S5 HRTEM of (a) FDU-15/Fe_2O_3, (b) CMK-8/Fe_2O_3, and (c) OMCNW/Fe_2O_3, all scale bars are 50 nm.

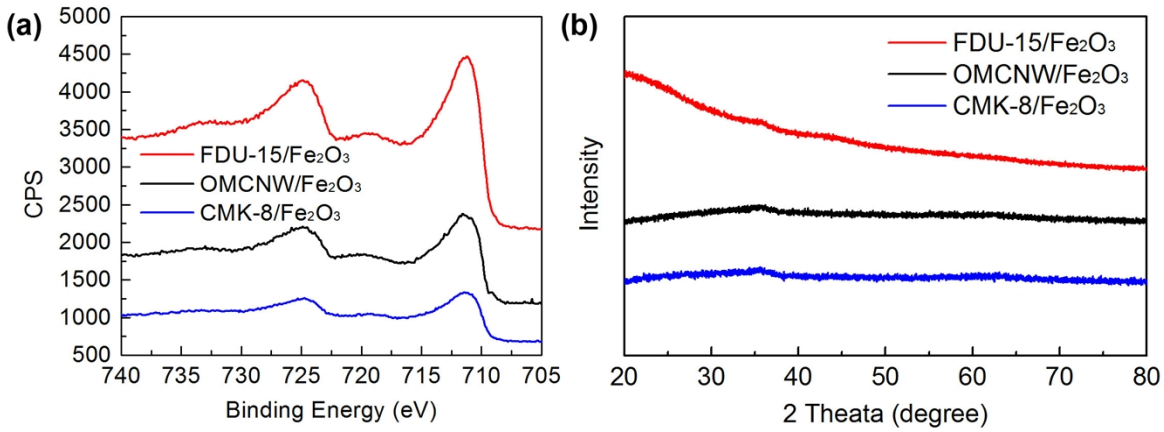

Figure S6 (a) XPS and (b) XRD spectrums of OMC/Fe_2O_3 composites.

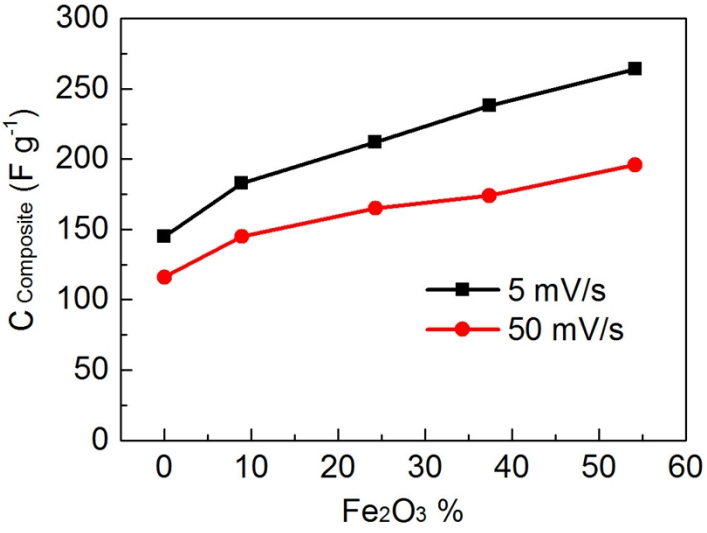

Figure S7 Specific capacitance of OMCNW/Fe_2O_3 with different Fe_2O_3 % at the scan rates of 5 mV s^{-1} and 50 mV s^{-1}.

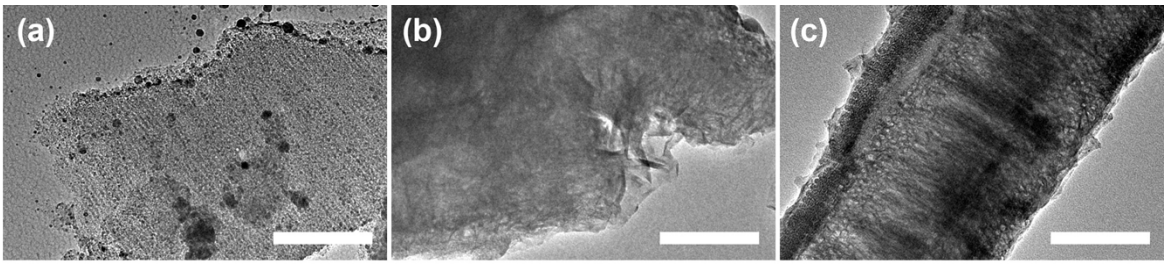

Figure S8 TEM images of (a) FDU-15/Fe_2O_3, (b) CMK-8/Fe_2O_3, (c) OMCNW/Fe_2O_3 after 1000 cycles, all scale bars are 200 nm.

Table S1 Mesopore volume change in OMCs & OMC/Fe_2O_3 composites*

Sample ID	FDU-15	FDU-15/Fe_2O_3	CMK-8	CMK-8/Fe_2O_3	OMCNW	OMCNW/Fe_2O_3
V_{meso} ($cm^3\ g^{-1}$)	0.311	0.199	1.158	0.123	1.715	0.322
ΔV_{meso} %	-	20.7 %	-	80.5 %	-	59.0 %
Fe_2O_3 wt%		20.0 %		47.1 %		54.2 %

* All data are calculated from adsorption branches.
V_{meso}: mesopore (2 nm < d < 50 nm) volume;
ΔV_{meso} %: normalized mesopore volume change after Fe_2O_3 loading based on original carbon.
Fe_2O_3 wt%: Fe_2O_3 loading amount.