Electronic Supplementary Material (ESI) for RSC Advances

A novel route for preparing graphitic ordered mesoporous carbon as electrochemical energy storage material

Dingsheng Yuan, Fulong Zeng, Jin Yan, Xiaoli Yuan, Xiangjin Huang, Wujun Zou*

Department of Chemistry and Institute of Nanochemistry, Jinan University, Guangzhou, 510632, PR China

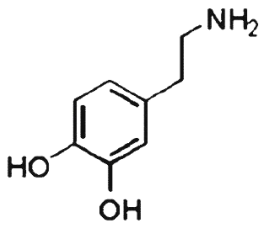

Fig.S1 the molecule structure of dopamine.

In the same experimental procedure, the different samples were also prepared by using the different catalyst contents at the different carbonization temperature. First, the effect of the graphitic degree on the carbonization temperature was performed by using 1.0 g MNi at 700, 800 and 900 ^{o}C. The carbon samples were labelled as GOMC-700, GOMC-800 and GOMC-900. Compared with GOMC-900, the (002) peak of OGMC-700 and OGMC-800 becomes lower and the other diffraction peaks were not presented, indicating that 900 ^{o}C was a suitable temperature for the preparation of the graphitized carbon as shown in Fig. S2a. Secondly, the different catalyst contents were carried out at 900 ^{o}C. When catalyst content was less than 0.5 g catalyst, the yield of GOMCs was very low. The compared XRD patterns of GOMCs

from 0.5 g and 1.0 g MNi were shown in Fig. S2b. GOMC-1 has higher graphitic degree. However, some disordered porous carbon in GOMC-1 could be observed by TEM images in Fg. S2c and d.

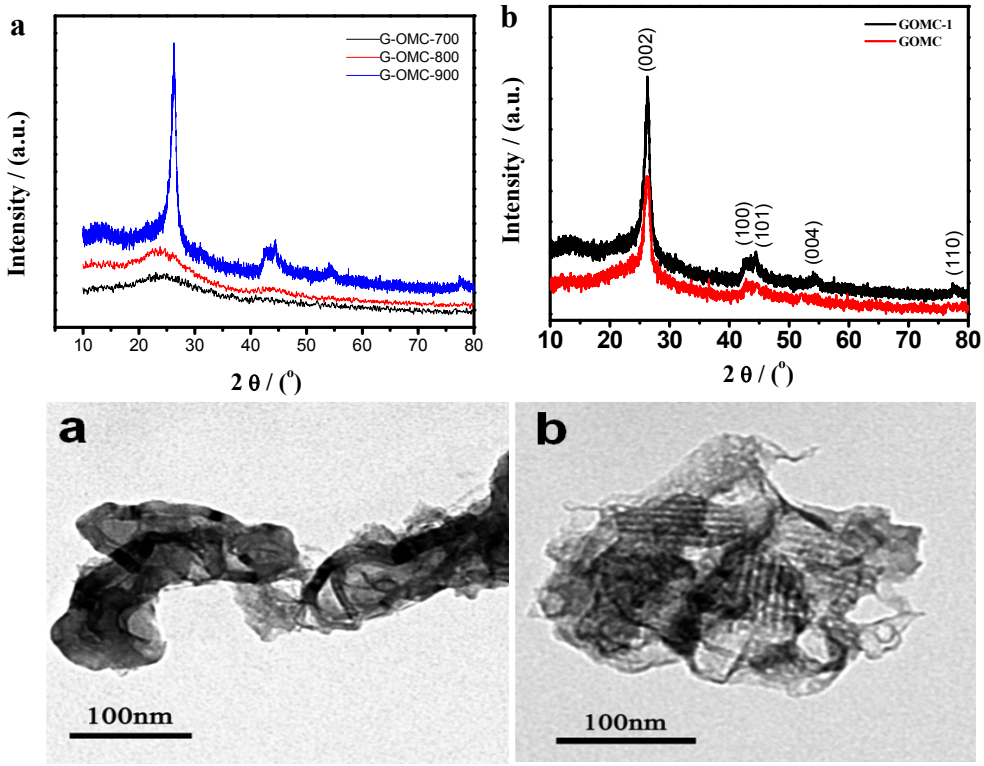

Fig. S2- XRD patterns of the G-OMCs obtained at different temperatures (a) and catalyst contents (b). TEM images of disordered structure (c) and ordered structure (d) of GOMC-1.

The electrochemical performance GOMC-1 was also studied, as shown in Fig. S3, but the specific capacitance is not satisfactory because of the higher graphitization to result in the ordered structure destroyed.

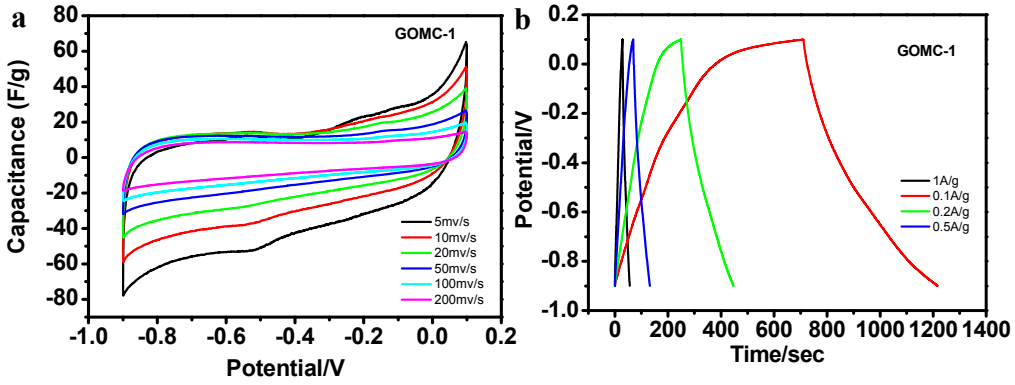

Fig. S3- Cyclic voltammograms of (a) GOMC-1 at different scan rates in 6 mol / L KOH electrolyte. Galvanostatic charge/discharge curves of (b) GOMC-1 at different current densities.

Table S1 Specific capacitances of GOMC and GOMC-1 obtained by Galvanostatic charge-discharge measurements.

Current densities		0.1 A/g	0.2 A/g	0.5 A/g	1 A/g
G-OMC-1	C_g (F/g)	51	40	32	29
GOMC	C_g (F/g)	183	109	91	84

The preparation of CMK-3D

The ordered mesoporous carbon (CMK-3D) was prepared by replication using SBA-15 as template and dopamine as carbon source. Typically, 1.0 g of SBA-15 was impregnated with an aqueous solution obtained by dissolving 1.25 g of dopamine and 0.14 g of H_2SO_4 in 5.0 g of deionized water. The mixture was then dried at 100 ^oC for 6 h, and subsequently at 160 ^oC for 6 h. In order to obtain fully polymerized and carbonized dopamine inside the pores of the silica template, 0.8 g of dopamine, 0.09 g

of H_2SO_4, and 5 g of water were again added to the pretreated sample and the mixture was again subjected to the thermal treatment described above. The dopamine / silica composite was calcined at 900 °C for 6 h under nitrogen atmosphere to complete the carbonization. The silica template was dissolved with 5 wt% hydrofluoric acid at room temperature. The resultant product was filtered, washed with deionized water and ethanol and dried. The porous structure parameters for CMK-3D include 762 m^2 / g of BET surface (S_{BET}), 3.7 nm of average pore diameter (D), 0.71 mL / g of volume (D).

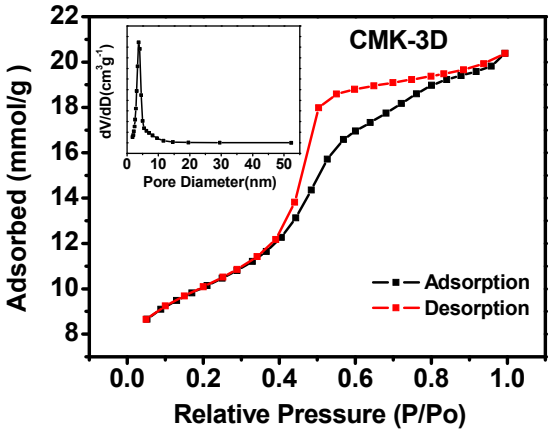

Fig.S4 N_2 adsorption-desorption isotherm and pore size distribution of CMK-3D.

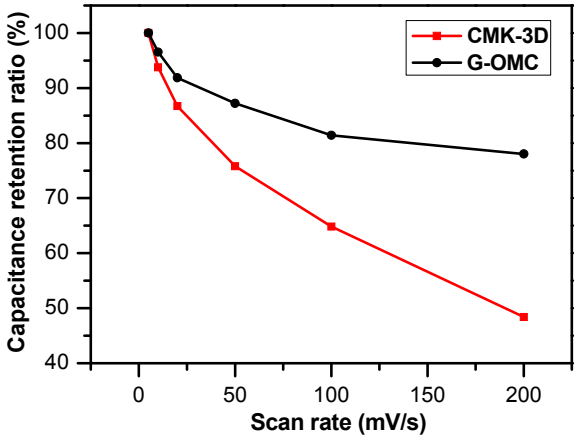

Fig.S5 Comparison for the capacitance retention of G-OMC and CMK-3D electrodes

at different scan rates.

Table S2 Specific capacitances of G-OMC and CMK-3D obtained by 3-electrode cell measurements

Current densities (A / g)		0.1A/g	0.2A/g	0.5A/g	1 A/g	2 A/g	5 A/g
GOMC	C_g (F/g)	183	109	91	84	80	75
	C_s (μF/cm^2)	68	41	34	31	30	28
CMK-3D	C_g (F/g)	146	131	118	109	100	75
	C_s (μF/cm^2)	19	17	15	14	13	10

Table S3 Specific capacitances of G-OMC obtained by 2-electrode cell measurements in 6.0 mol / L KOH and 1.0 mol / L $LiClO_4$ / EC / DMC electrolytes

Current densities (A / g)		0.1	0.2	0.5	1	2	5
Specific capacitance (F / g)	KOH (Potential: 1V)	96	87	77	65	53	40
	$LiClO_4$/(EC+DMC) (Potential: 2.5 V)	74	68	60	51	40	32