

Supporting Information

Ultrahigh Surface Area Hierarchical Porous Carbons Based on Natural Well-defined Macropores in Sisal Fibers

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Experimental

Preparation of SF-HPC and SF-500: Sisal fibers were cut into 0.1~0.5 cm lengths prior to use. The fibers were subjected to pre-carbonization by heating at 500 °C for 3 h under N₂ flow. The resulting samples are referred to as SF-500 in the paper. Subsequently, the SF-500 fibers were mixed with KOH at a weight ratio of 1:5 and H₂O was added to dissolve the KOH pellets. The mixture was stirred until uniform and then left for about 1 h to further ensure complete infiltration of the SF-500 by the KOH solution. Then, the mixture was dried at 100 °C for 6 h in an oven and then carbonized in a tubular furnace at 900 °C for 3 h under N₂ flow. After the mixture completely cooled down to room temperature, the materials were washed with hydrochloric acid and distilled water, and dried, yielding the sample of hierarchical porous carbon based on sisal fiber identified as SF-HPC. For comparison, other SF-HPC samples with lower KOH/SF-500 weight ratios (SF-HPC-x, where x is the KOH/SF-500 weight ratio) were also prepared according to the same procedure.

Preparation of OMC: For the preparation of the OMC sample where the phenol/formaldehyde/NaOH/F127 ratio was from the reference (Meng, Y.; Gu, D.; Zhang, F. Q.; Shi, Y. F.; Cheng, L.; Feng, D.; Wu, Z. X.; Chen, Z. X.; Wan, Y.; Stein, A.; Zhao, D.Y. *Chem. Mater.* **2006**, *18*, 4447), 0.61 g of phenol was melted in a flask and mixed with 0.13 mL of 5 mol/L NaOH aqueous solution under stirring. Then, 1.05 g of 37wt% formaldehyde solution was added. Subsequently, the clear mixture was reacted under stirring for 1 h at 73 °C and then was cooled to room temperature. The pH was adjusted to ~7.0 by 5 mol/L HCl aqueous solution. The final product was dissolved in

ethanol to obtain a resol solution. Meanwhile, 1 g of Pluronic F127 was dissolved in ethanol/H₂O mixture solvent under stirring, followed by being mixed with the above resol solution. The homogeneous mixture was transferred to a dish and evaporated for 7~15 h at room temperature, followed by heating for 24 h at 105 °C. The as-prepared product was carbonized for 3 h at 900 °C in N₂ flow. The heating rate was 1 °C/min below 600 °C and then was increased to 5 °C/min above 600 °C.

Characterization: The microstructure of the samples was investigated by a JSM-6330F scanning electron microscope (SEM) and JEM-2010HR transmission electron microscope (TEM). The N₂ adsorption-desorption isotherms were obtained from N₂ adsorption measurement that was carried out using a Micromeritics ASAP 2010 analyzer at 77K, and then the BET surface area (S_{BET}), the mesopore volume (V_{mes}), and the micropore volume (V_{mic}) were determined by Brunauer-Emmett-Teller (BET) theory, Barrett-Johnner-Halendar (BJH) method, and t-plot theory, respectively. The total pore volume (V_{t}) and the macropore volume (V_{mac}) were derived from mercury porosimetry measurements that were conducted by a PoreMaster 60 (Quantachrome Instruments). V_{mac} represent cumulative pore volume of pores with diameters above 50 nm. The pore size distribution was analyzed both by N₂ adsorption measurement with density functional theory and by the mercury porosimeter. The static adsorption measurements toward benzene vapor were carried out at 23.9 °C by a weight method. The dynamic adsorption properties of the samples were studied with an IG-3 intelligent gravimetric analyzer (Hiden Isochema, Ltd., Warrington, UK).



Fig. S1 Photographs of (A) natural sisal in a plantation (B) leaves of sisal plant (C) sisal fibers. Sisal fibers are obtained by extraction from the shredded leaf tissues of sisal.

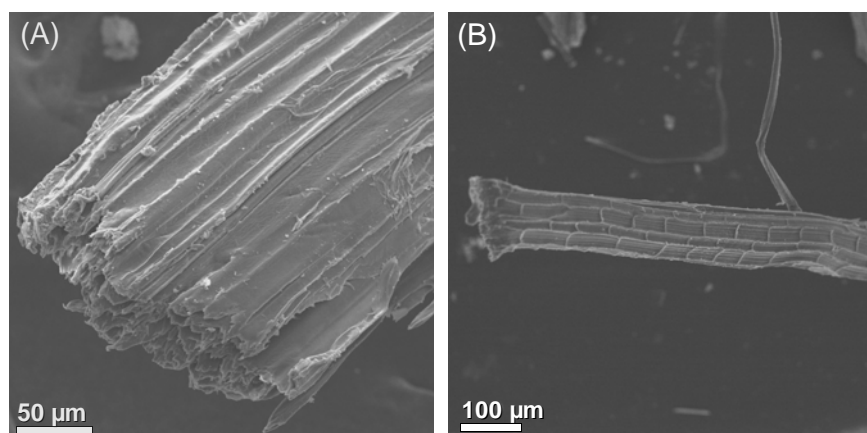


Fig. S2 SEM images of A, B) sisal fiber.

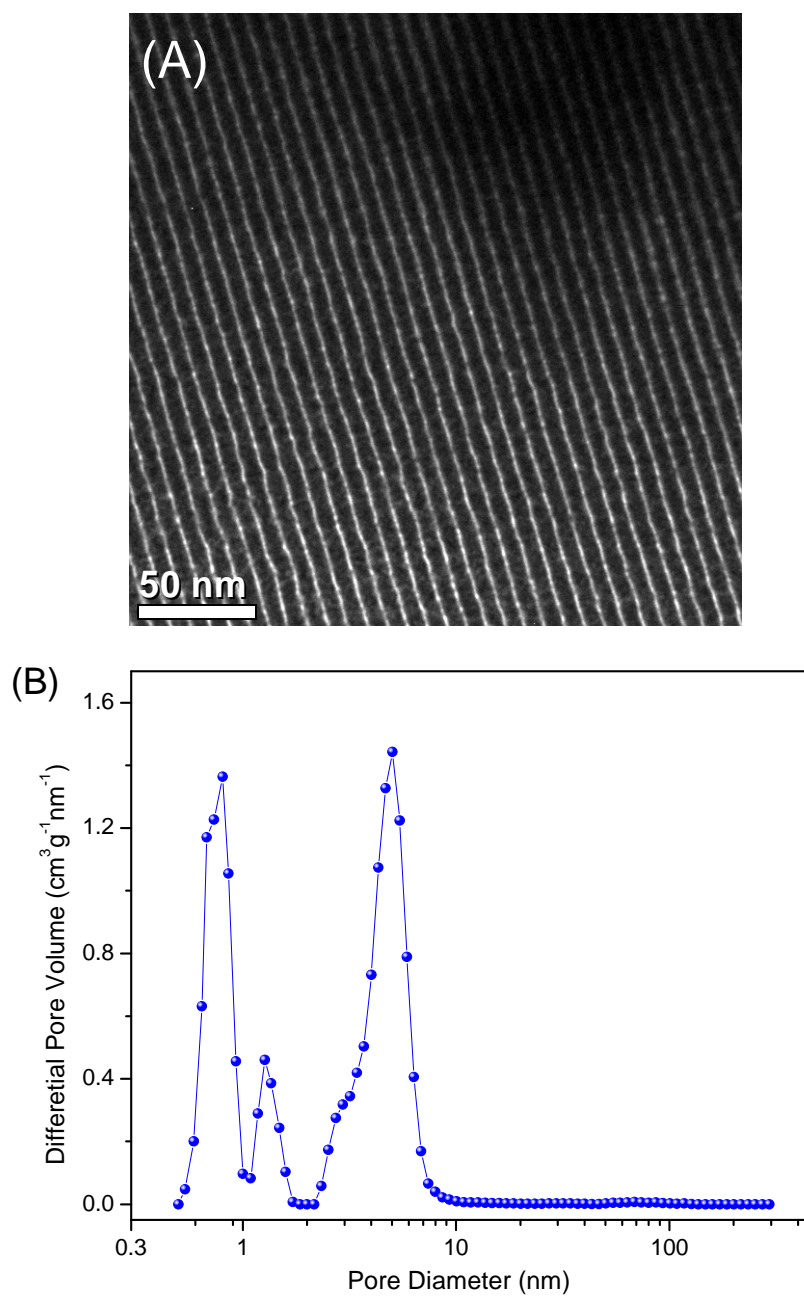


Fig. S3 The microstructures of OMC sample: (A) TEM image and (B) DFT pore size distribution.

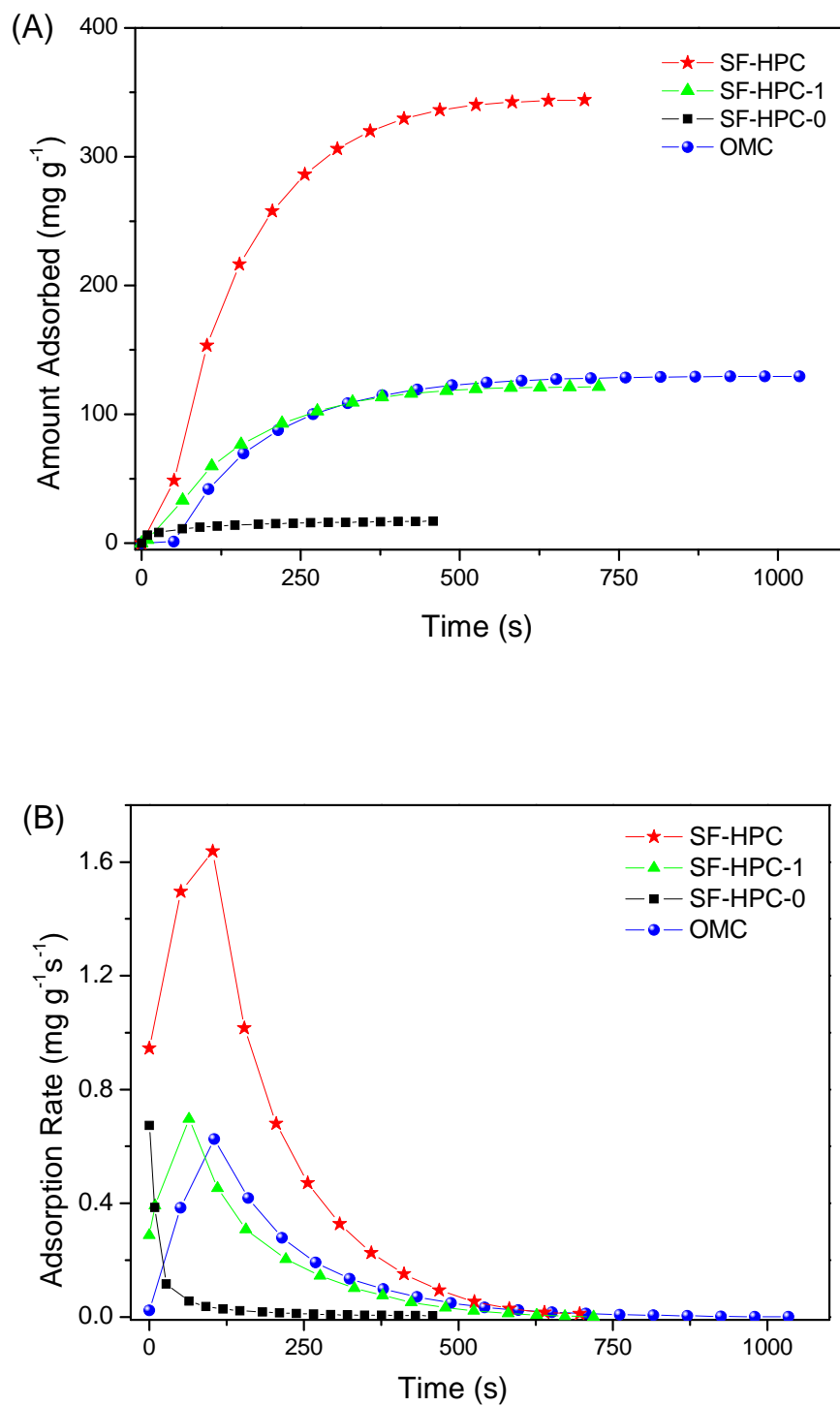


Fig. S4 Adsorption rate of SF-HPCs and OMC for 0.64 mb benzene vapor.

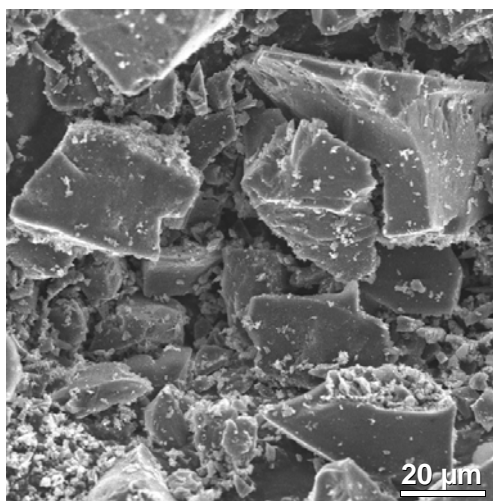


Fig. S5 SEM images of OMC.

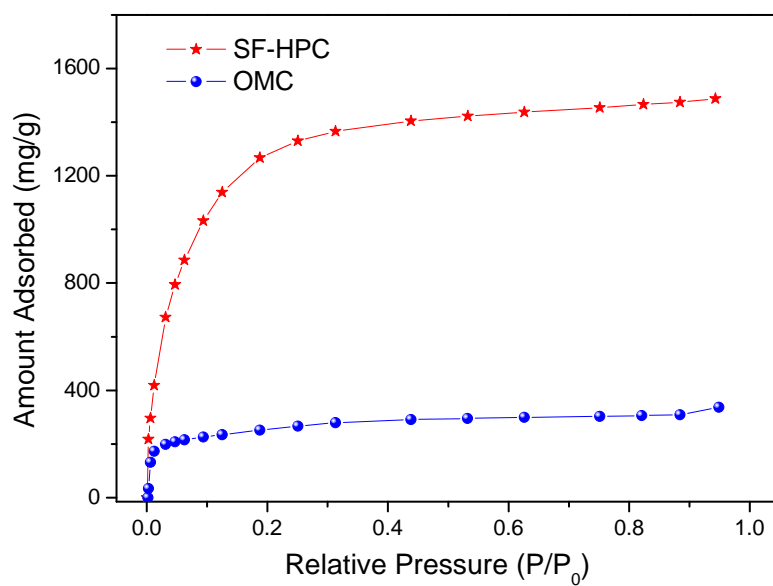


Fig. S6 Adsorption isotherms of benzene vapor on SF-HPC and OMC (23.9 °C).

Table S1. The yield and BET surface area of SF-HPCs

Sample	KOH/SF-500 weight ratio	Yield (%)	S _{BET} (m ² /g)
SF-HPC-0	0	20	182
SF-HPC-1	1	10	1331
SF-HPC	5	6	3350