Supplementary Information

Simple synthesis of graphitic ordered mesoporous carbon supports using natural seed fat

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Experimental Section

Synthesis of graphitic ordered mesoporous carbons: A simple and effective solid-liquid grinding templating route was developed to synthesize graphitic ordered mesoporous carbons. The preparation of ordered mesoporous silica SBA-15 template with rod-like morphology has been described previously,[1] and various liquid state seed fats which are derived from soybean, peanut, colza, sunflower seed and maize were used as carbon precursors. In a typical synthesis, ordered mesoporous silica SBA-15 (5.0g) and seed fat (10.0g) were ground together for 4 hours on a ball mill machine to get a homogeneous mixture, then the mixture was transferred into a tube furnace to carbonize the precursor at the temperature of 600～900 ^{o}C for 5 hours under Ar flow, the resultant carbon-silica composites were treated with 10% HF aqueous solution to remove the silica template.

Photocatalyst preparation: TiO_2 supported photocatalysts were synthesized by sol-gel hydrolysis and impregnation method according to literature methods.[2] Typically, 0.30 g of carbon materials was dispersed in 10 ml of isopropanol solution with an appropriate amount of titanium tetraisopropoxide (TTIP) and stirred at room temperature for about 45 min, then 10.0 g of H_2O was added under vigorous stirring. After stirring for another 45 min, the mixture was centrifuged and the recovered solid was dried at 100 ^{o}C overnight and calcined at 450 ^{o}C for 3 h under the protection of argon before being used as the photocatalyst. Pure TiO_2 catalyst was prepared by the same method but without adding any carbon support in the above experimental process.

Structural Characterization: Small-angle X-ray diffraction (XRD) patterns were collected in θ-2θ mode using Rigaku D/MAX-2550VB/PC diffractometer ($CuK\alpha_1$ radiation, λ=1.5406Å), operated at 40 kV and 200 mA (scanning step: 0.02 º per second). Wide-angle XRD patterns were collected in the same mode, but operated at 100 mA. Scanning electron microscopy (SEM) images were performed on a Philips XL-30 scanning electron microscope operating at an acceleration voltage of 25 KV. Transmission electron microscope (TEM) images were taken using a JEOL JEM-2010 electron microscope with an acceleration voltage of 200 KV. Nitrogen sorption isotherms were measured at -196 °C on a Micromeritics ASAP 2000 apparatus. Raman spectra were obtained with a Dilor LabRam-1B microscopic Raman Spectrum, using the He-Ne laser with the excitation wavelength of 632.8nm.

Photocatalytic test: Photocatalytic reactions were carried out in a 500 mL quartz reactor. Catalyst powder (0.20 g) was suspended in 200 ml of 0.1 M NaOH aqueous solution for typical batches. Illumination was performed with a 300 W medium-pressure mercury lamp with a peak light intensity at 365 nm in the center of the quartz reactor. CO_2 was bubbled through the reactor for at least 30 min to purge air and to saturate the solution. The reactor was tightly closed during the reaction, and the CO_2 pressure was maintained at 110 KPa. A magnetic stirring bar at the bottom agitated the catalyst-suspended solution to prevent sedimentation of the catalyst and the reaction temperature was fixed at 30 ^oC. The yield of CO and CH_4 were analyzed by a gas chromatography-mass spectrometry (Shimadzu, GCMS-QP2010E).

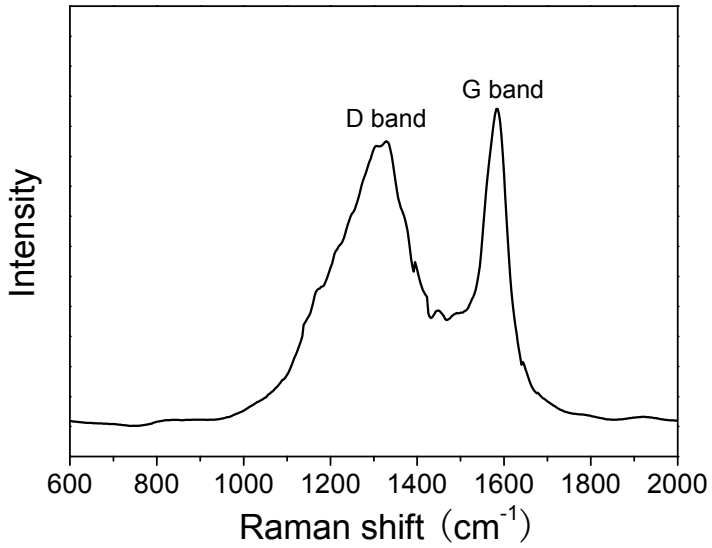

Figure S1. Raman spectrum of graphitic ordered mesoporous carbon SBO-700.

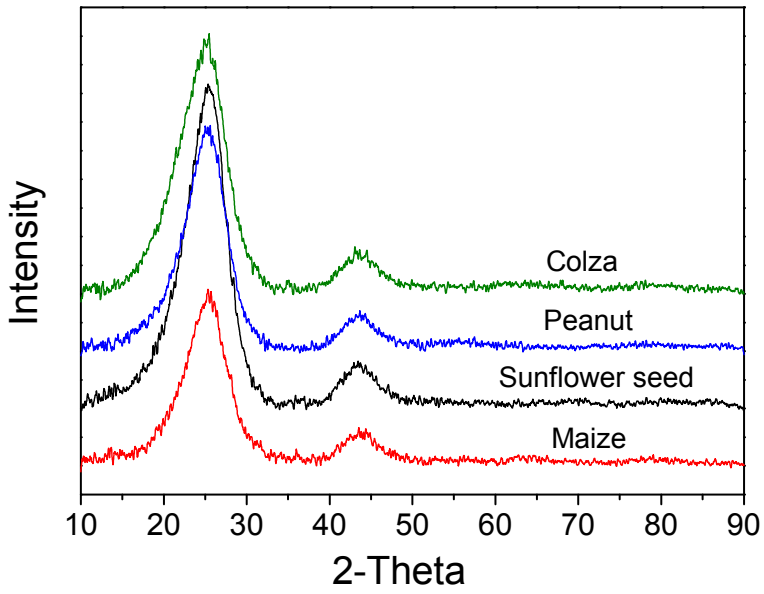

Figure S2. Wide-angle XRD patterns of carbon replicas derived from different seed fats at 700 ^{o}C pyrolysis temperatures

Table S1. Textural properties of graphitic ordered mesoporous carbon materials derived from different seed fats

Samples	Source of seed fat	Pyrolysis temperature [^{o}C]	S_{BET} [m^2g^{-1}]	D_P[a] [nm]	V_t[b] [$cm^3\ g^{-1}$]	d_{002}[c] [nm]
SBO-700	soybean	700	598.4	3.8	0.414	0.351
SBO-900		900	566.8	3.6	0.441	0.348
PNO-700	peanut	700	609.8	3.7	0.567	0.352
SFSO-700	sunflower seed	700	679.4	3.8	0.621	0.350
MO-700	maize	700	605.1	3.7	0.439	0.353
CO-700	colza	700	595.7	3.8	0.439	0.352

[a] Total pore volume at relative pressures 0.95. [b] Pore diameter calculated from the desorption branch of the isotherm using the BJH method. [c] Evaluated from wide-angle XRD patterns.

References

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