Electronic Supplementary Information

MCM-48 Nanorods: A Self-Assembled Isotropic Cubic Mesostructure with an Anisotropic Morphology

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Experimental details

Synthesis

Mesoporous silica materials were synthesized by slowly injecting TEOS to the NaOH solution of mixed surfactants and IPA. The molar composition of the synthesis mixture was 1.0 TEOS : 0.17 (CTAB + $C_{12}EO_4$) : *x* IPA : 0.4 NaOH : 1300 H_2O, and the molar fraction of $C_{12}EO_4$ in the surfactant mixture is denoted by f_n. The mixture was stirred at 35 °C for 24 h, further aged at 100 °C for 24 h, and was finally filtered and dried. The surfactants in the as-synthesized materials were removed by calcinations at 540 °C for 3 h. For the preparation of Pt-infiltrated samples, the silica (0.2 g) was impregnated with $H_2PtCl_6 \cdot 6H_2O$ (0.36 g) and was heated to 200 °C in a stream of hydrogen to reduce the metal.

Characterization methods

The XRD patterns were obtained with a CuKα X-ray source using a Mac Science 18MPX diffractometer. SEM images were obtained with a JEOL JSM-7000F microscope operated at 10 kV. TEM images were obtained using a JEOL JEM-2010 microscope operated at 200 kV. Gas physisorption isotherm was measured at 77 K using a Quantachrome Autosorb-1MP instrument. The pore diameter was evaluated by analyzing the desorption branch using the Barrett-Joyner-Halenda (BJH) method. The surface area was calculated from the adsorption branches in the relative pressure range of 0.05-0.20 by the Brunauer–Emmett–Teller (BET) method, and the pore volume was evaluated at a relative pressure of 0.8.

SAXS measurements were performed at the beamline 23A1 of National Synchrotron Radiation Research Center (NSRRC), Taiwan, using X-ray with photon energy of 10.0 keV. One-dimensional SAXS profiles were circularly averaged from 2D images obtained using a multi-wire area detector. The sample-to-detector distance was 1830 mm. The scattering wavevector q, $4\pi\sin(\theta)/\lambda$, defined by the scattering angle 2θ and wavelength λ, was calibrated with silver behenate, and the scattering intensity $I(q)$ was calibrated to the absolute intensity scale with a polyethylene sample. For SAXS measurements, the synthesis mixture obtained after the addition of TEOS was sucked out and quickly injected into a Kapton-sealed thin container, through which the X-ray beam passed, at different reaction time *t*. Besides, the solid products collected by quenching the synthesis immediately followed by filtration and drying at reaction time *t* were analyzed by SEM.

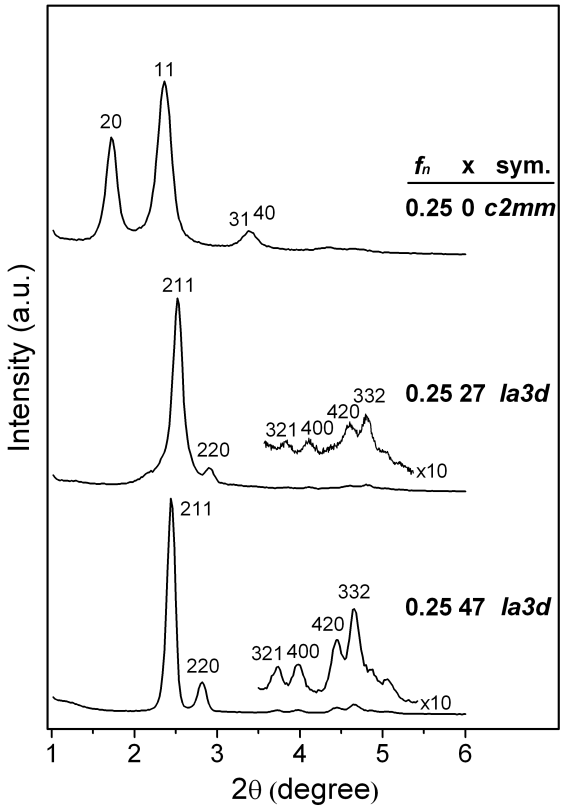

Figure S1. XRD patterns of the calcined samples with f_n = 0.25 and x =0, 27 and 47.

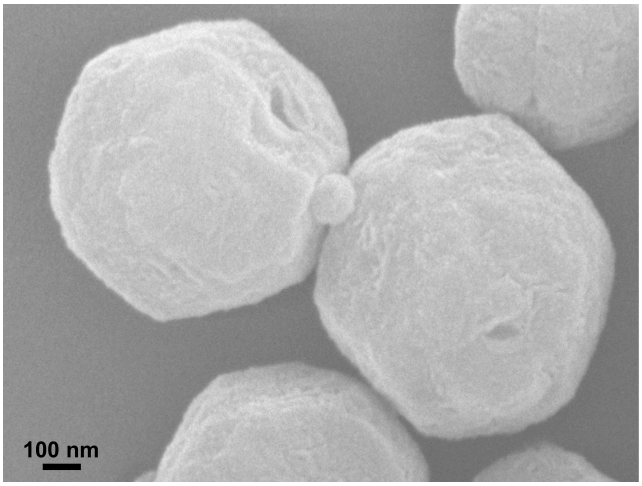

Figure S2. SEM image of the MCM-48 sample with f_n = 0.25 and x = 47.

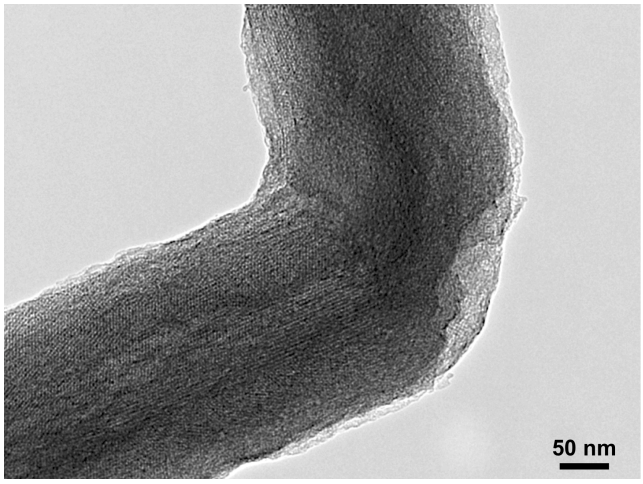

Figure S3. TEM image of MCM-48 nanorods at the joint of two arms.

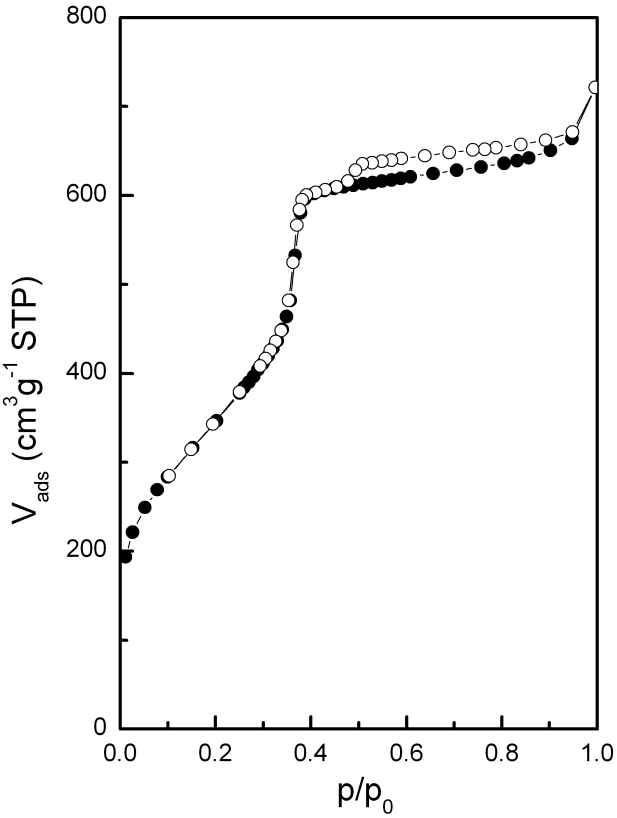

Figure S4. Nitrogen physisorption isotherm of MCM-48 nanorods.

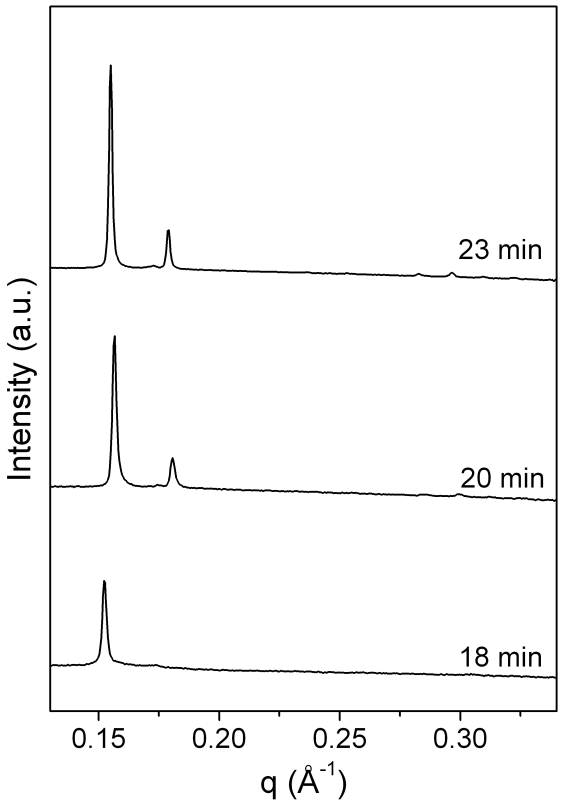

Figure S5. SAXS patterns of the synthesis mixture of MCM-48 nanospheres taken at different reaction times.