Electronic Supplementary Information

2D-Rectangular *c2mm* Mesoporous Silica Nanoparticles with Tunable Elliptical Channels and Lattice Dimension

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Experimental details

Synthesis

Mesoporous silica nanoparticles were synthesized by injecting TEOS to the NaOH solution of mixed surfactants, and the injection rate was 18 mLh^{-1}. The molar composition of the synthesis mixture was 8:f_n:(1-f_n):2.56:9840 TEOS:$C_{12}EO_4$:CTAB:NaOH:H_2O. The mixture was stirred at 35 °C for 24 h, further aged at 100 °C for 24 h, and finally was filtered and dried. The surfactants in the as-synthesized materials were removed by calcinations at 540 °C for 6 h. For the preparation of Pt-infiltrated MMT-1 sample, the mesoporous silica material synthesized with f_n=0.25 (0.2 g) was impregnated with tetraammine platinum(II) nitrate (0.002 g) and was heated to 300 °C in a stream of oxygen. Additional amount of the same platinum precursor (0.32 g) was then impregnated, and the sample was then heated to 300°C in a stream of hydrogen to reduce the metal.

Characterization methods

PXRD data were obtained on a Mac Science 18MPX diffractometer using CuK_α radiation. Time-resolved SAXS measurements were tested and performed by using synchrotron X-ray (photon energy of 10.0 keV) on the beamlines 17B3 and 17A at NSRRC, Taiwan. Each reaction for the measurement was carried out in a batch reactor, and the reaction mixture was continuously pumped through a Kapton-sealed thin container, through which the X-ray beam passed, and then back to the reactor at a pumping rate of 40 mL/min. Both the reactor and the container were thermostated to a desired temperature of 35 °C. Gas physisorption isotherms were measured at 77 K using a Quantachrome Autosorb-1MP instrument. The pore diameter was evaluated by analyzing the reversible nitrogen sorption isotherms by nonlocal density functional theory (NLDFT) (by applying a N_2(77K) kernel based on cylindrical pore geometry). The surface area was calculated from the adsorption branches in the relative pressure range of 0.05-0.20 by the BET method, and the pore volume was evaluated at a relative pressure of 0.8. The SEM image was obtained with a JEOL JSM-7000F SEM operating at 200 kV. The TEM images were obtained using a JEOL JEM-2100F TEM (Cs=0.5mm, Point resolution 0.19nm) at 200 kV (Fig. 4b-e) and a JEOL JEM-2010 TEM at 200 kV (Fig. 4f).

Table S1. Structural properties of calcined mesoporous silica materials

f_n	Pore diameter[a] (nm)	Surface area[b] ($m^2 g^{-1}$)	Pore volume[c] ($cm^3 g^{-1}$)
0	3.9	1485	1.18
0.17	4.0	1183	0.98
0.25	4.0	1110	0.83
0.35	3.8	972	0.69

[a] Evaluated by analyzing the reversible nitrogen sorption isotherms by nonlocal density functional theory (NLDFT) (by applying a N_2(77K) kernel based on cylindrical pore geometry)

[b] Calculated from the adsorption branches in the relative pressure range of 0.05-0.20 by the BET method

[c] Evaluated at a relative pressure of 0.8

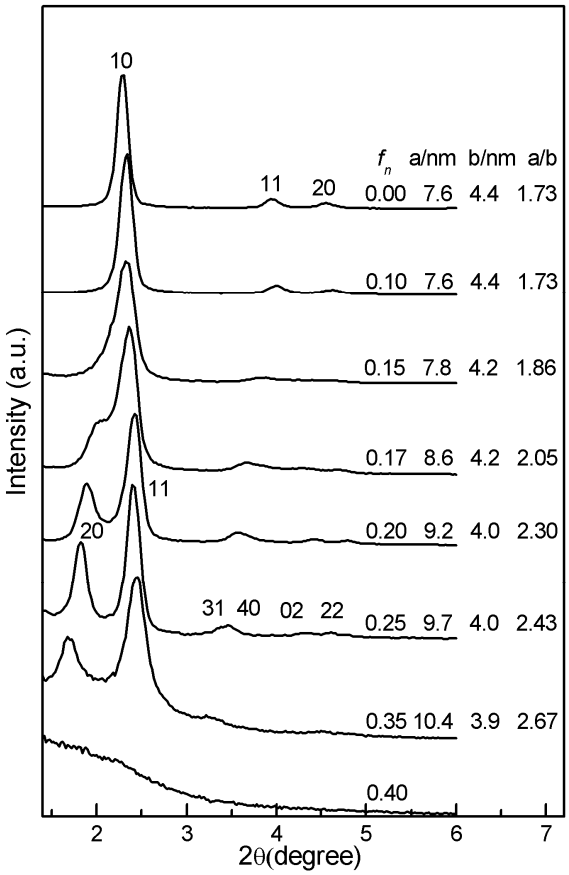

Figure S1. XRD patterns of the calcined mesoporous silica materials synthesized with different surfactant ratios.

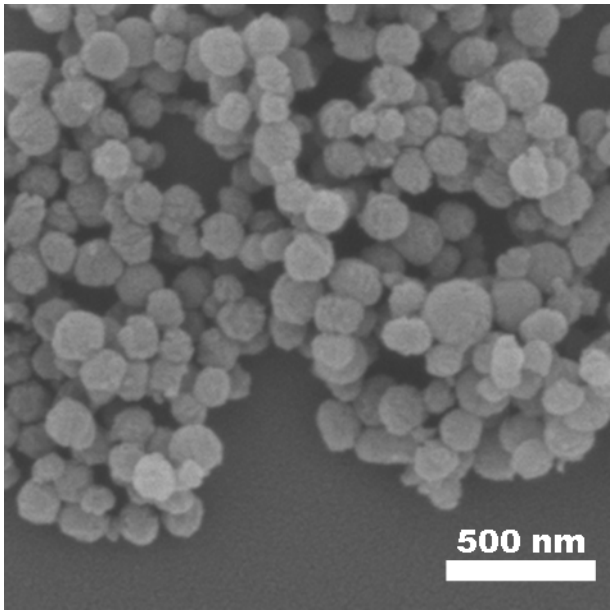

Figure S2. SEM image of the pure-silica MMT-1 materials synthesized with f_n=0.25.

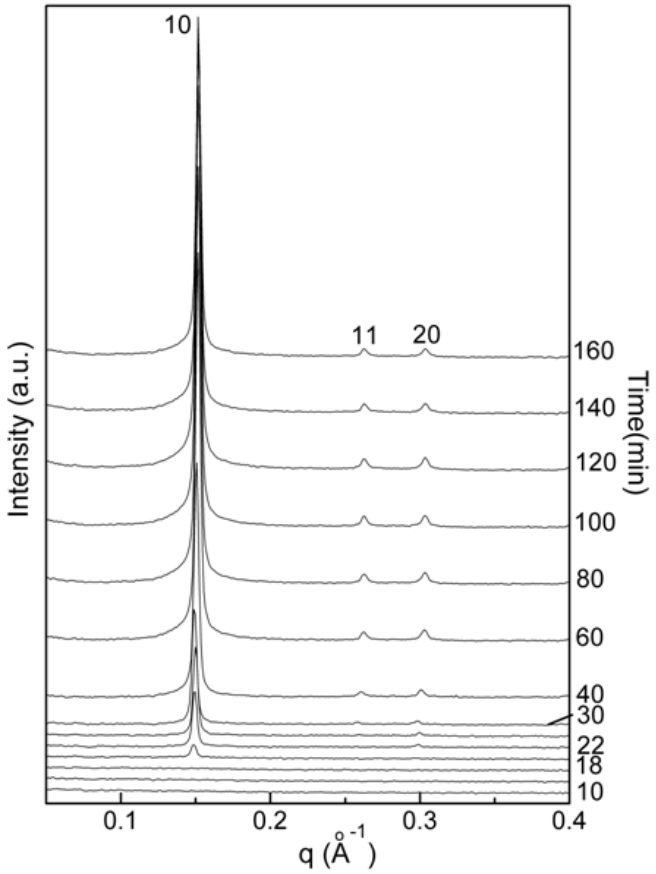

Figure S3. Time-resolved SAXS patterns of the mesoporous silica synthesized with f_n=0 (MCM-41).

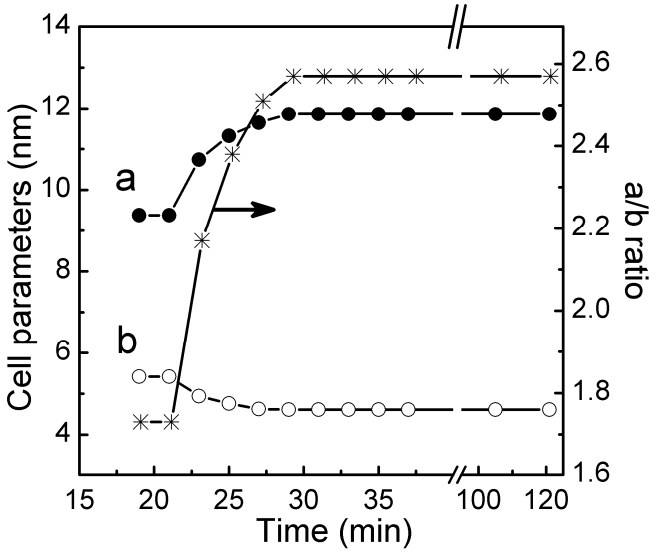

Figure S4. Temporal evolution of the cell parameters *a* and *b* and the *a*/*b* ratio.