

Hard Sphere Packing and Icosahedral Assembly in the Formation of Mesoporous Materials

Jiawei Tang[†], Xufeng Zhou[†], Dongyuan Zhao[†], Gao Qing Lu[§], Jin Zou[‡] and Chengzhong Yu^{†}*

[†] Department of Chemistry and Shanghai Key Laboratory of Molecular Catalysis and Innovative Materials, Fudan University, Shanghai, 200433, P. R. China, [‡] School of Engineering and Centre for Microscopy and Microanalysis, the University of Queensland, QLD 4072, Australia, and [§] ARC Centre for Functional Nanomaterials, the University of Queensland, Brisbane, Australia.

Supporting Information

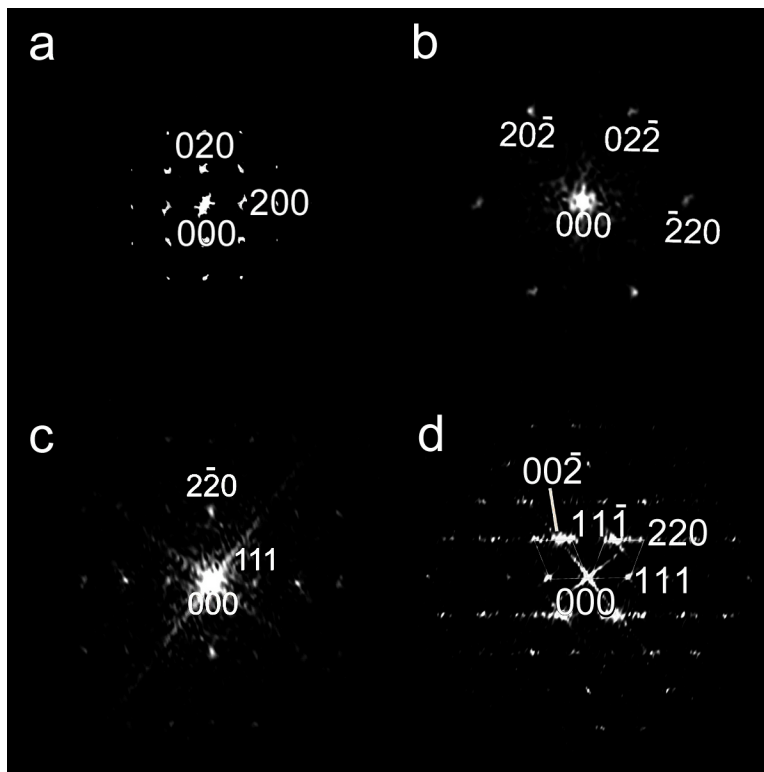
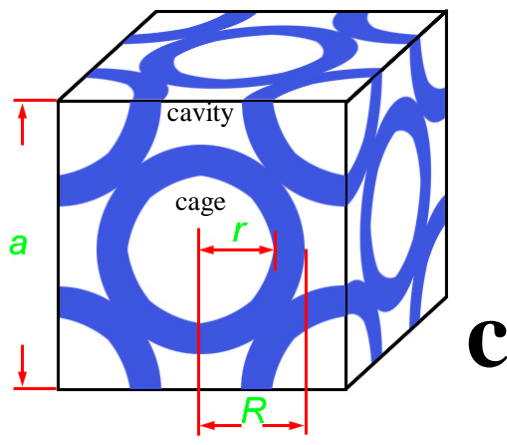
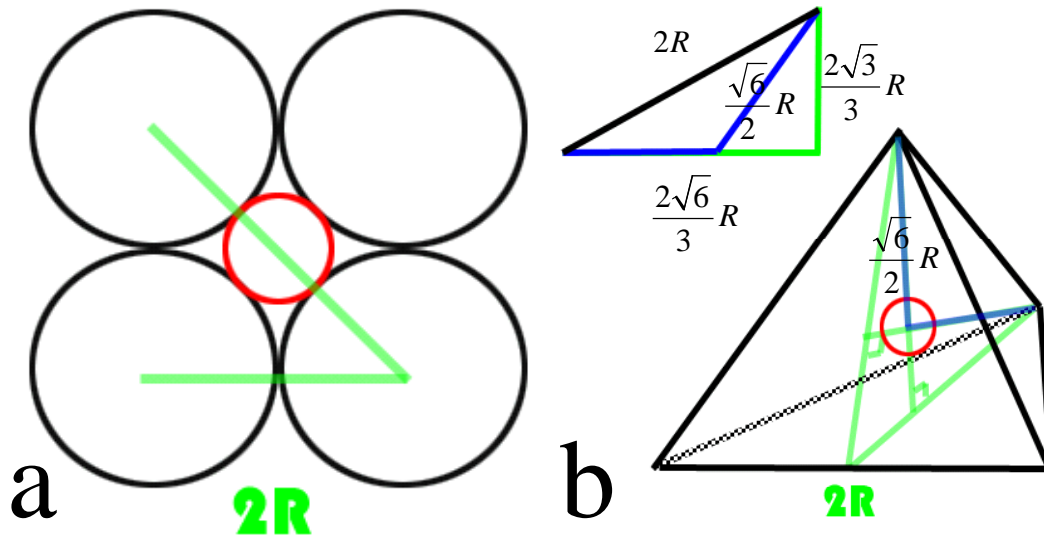


Figure S1. Fourier transformed electron diffraction patterns (a-d) from TEM images showing in Figure 2, showing the unique FCC pattern along the [100], [111], [211] and [110] zone axes, respectively. The twin-structure can be clearly seen along the [110] direction as marked in (d) and only one set of diffraction patterns is indexed.



a) $a = 2\sqrt{2}R = 27.1nm$, $D_{Octa} = a - 2R = 2(\sqrt{2} - 1)R = 7.94nm$;

b) $D_{Tetra} = 2(l_{Blue} - R) = 2(\frac{\sqrt{3}}{4}a - R) = (\sqrt{6} - 2)R = 4.31nm$.

Figure S2. Calculation of the diameters of the inscribed balls in octahedral sites (a) and tetrahedral sites (b). The model of mesoporous materials synthesized at 293K (c).

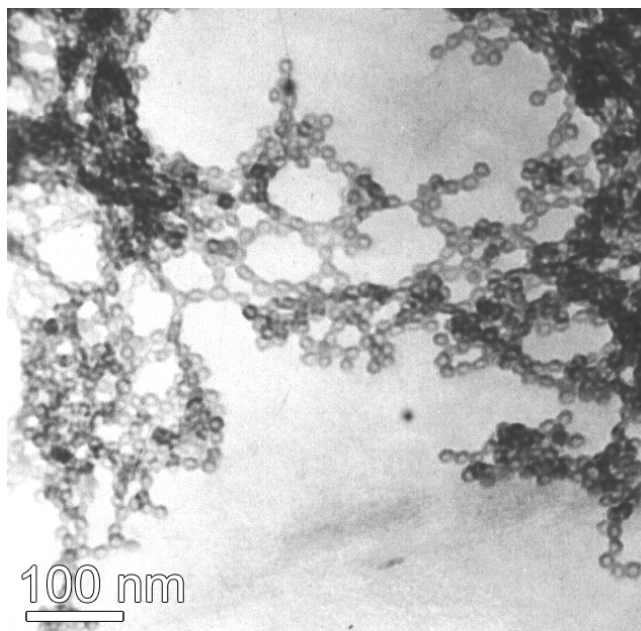


Figure S3. TEM images of uncalcined mesoporous materials. The reactant weight ratio was kept at F108/ TMB/ KCl/ TEOS/ HCl (2.0 M) = 1.0: 1.0: 2.5: 1.5: 30 (g) and the temperature were controlled at 293 K. It is noted that little precipitates can be observed in the solution, thus a large amount of alcohol was added. The resultant white precipitates were filtered and washed by water.

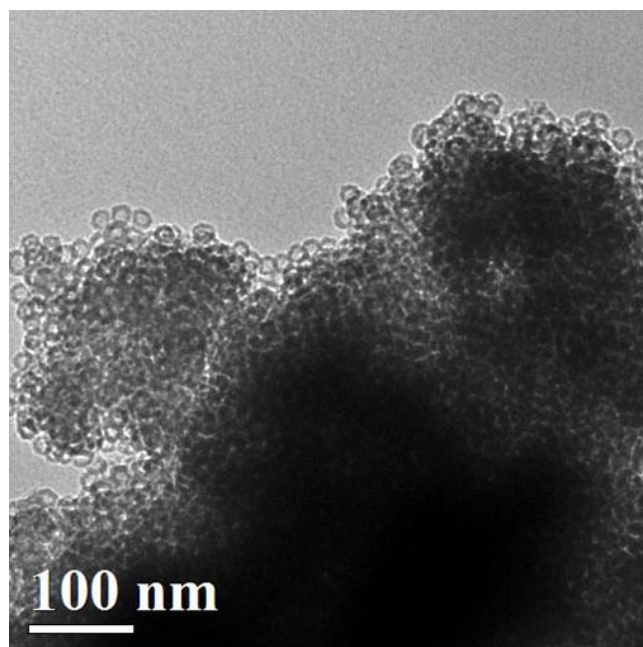


Figure S4. TEM images of calcined mesoporous materials synthesized at the optimum condition 293 K and the reactant weight ratio was kept at F108/ TMB/ KCl/ TEOS/ HCl (2.0 M) = 1.0: 1.0: 2.5: 2.8: 30. This disordered phase is observed in addition the major FCC phase and the icosahedral morphology.