Using well-defined block amphiphilic copolymers as templates for synthesis of mesoporous silicas with different mesostructures

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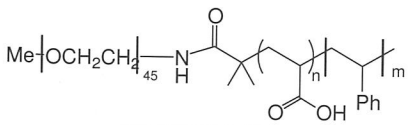
Since the discovery of M41S family mesoporous silicates, researches involving the development of novel catalysts and supports have received much attention.[1-2] Various mesostructural silicas have been developed in succession and are synthesized through an assembly mechanism between organic surfactants or block copolymers and silicon precursors.

Highly ordered mesoporous silicas with large accessible pores have been prepared by using pre-synthesized poly(ethylene oxide)-*b*-poly(methyl acrlyate) (EO_nMA_m) diblock copolymers as templates. By adjusting the chain length of EO versus that of MA, a series of silica mesostructures, including two-dimensional (2-D) hexagonal, 3-D bicontinuous (*Ia3d*), and body-centered cubic (*Im3m*) symmetries, were prepared with the use of tetraethyl-orthosilicate (TEOS) as the silica precursor under acidic conditions [3].

Mesostructured cellular silica foams (MCFs) have prepared by using well-defined triblock copolymer (EO-MA(OH)-St) [St: styrene] as a template in the presence of cobalt ions under weak acidic conditions. This is the report using cobalt complexation to direct assembly of triblock copolymer in the synthesis of mesoporous silicas. These foam-like materials consist of high BET surface area (350-500 m^2/g), large pore volume (1.0-1.2 cm^3/g), and uniform pore size (~20 nm). Furthermore, this preparation method provides the well-dispersed cobalt ions in the framework because of metal complexation during the processes of assembly/condensation. The mesostructures of all materials are characterized by small-angle X-ray scattering, nitrogen adsorption-desorption, transmission electron microscopy, scanning electron microscopy and ICP mass spectroscopy.



EO-MA(OH)-St

[1] Kresge, C.T., Leonowicz, M.E., Roth, W.J., Vartuli, J.C.and Beck, J.S., *Nature* 359 (1992) 710.
[2] Wan, Y.; Zhao, D.*Chem. Rev.* 107 (2007) 2821.
[3] Chan, Y.-T., Lin, H.-P., Mou, C.-Y., Liu, S.-T., *Microporous Mesoporous Mater.* 123 (2009) 331.

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