

Synthesis of Silicates Having Hierarchical Porosity of Both Mesoscopic and Macroscopic Scales

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Inorganic system having both mesopores and macropores has attracted much interest recently due to the advantages combining the high surface area from mesoporous structures with the faster mass transport pathway from macroporous structures. Such materials with bimodal pore size distribution have been synthesized by templating the close packed array of colloidal crystal and liquid crystal like array of surfactant. However, this method takes relatively long time for synthesis and there is a difficulty in its scale up into a large industrial production. In this study, macrostructured mesoporous silicates was prepared by introducing the monodisperse submicron-sized polystyrene beads into the conventional procedure for the mesoporous silicates synthesis. The latex template and skeletal silica were characterized by SEM, TEM, XRD and N₂ adsorption. The periodic and interconnected macrostructure of resulting silicates was confirmed by SEM images. The silicates exhibit X-ray diffraction patterns and N₂ adsorption data showing the typical mesostructure of MCM-41. TEM images clearly showed that the skeletal silica had both well defined macropores and mesopores. This macrostructuring route is very attractive since it can be easily scaled up.