

Simple preparation of silica and alumina with a hierarchical pore system via the dual-templating method

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Abstract. Silica and alumina with macro-meso-type hierarchical pore systems are synthesized by dual templating using both surfactants and polystyrene (PS) spheres. After calcination, scanning electron microscope images show uniform macropores with a diameter of approximately 200 nm. This size coincides with that of the original PS spheres. The density of the macropores increases with the amount of added PS spheres in the precursor solutions. Transmission electron microscope images, small-angle x-ray scattering spectra and N₂ adsorption-desorption isotherms reveal the formation of ordered mesoporous structures in the macropore walls. Also, the existence of micropores (less than 2 nm in size) was confirmed from the large N₂ uptake at low relative pressures.

Keywords: mesoporous material, macroporous material, silica, alumina, hierarchical pore system

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