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Pore structure of mesoporous silica (KIT-6) synthesized at different temperatures using positron as a nondestructive probe

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Abstract

Ordered mesoporous SiO₂ (KIT-6) was synthesized using triblock copolymer P123 as the structure template and tetraethyl orthosilicate (TEOS, C₈H₂₀O₄Si) as silica source. Small-angle X-ray scattering and high resolution electron microscope measurements indicate the 3d cubic Ia3d symmetry of the pore structure of KIT-6 synthesized at 30°C-120°C. When the synthesis temperature increases to 180°C, the order of pores was deteriorated. The pore size was estimated by nitrogen adsorption/desorption measurements, which increases from 3.8 nm to 18.5 nm as the synthesis temperature increases from 30°C to 180°C. With the increase of mesopore size, the pore wall thickness shows continuous decrease. Positron annihilation lifetime spectra was measured for the synthesized KIT-6. The lifetime spectra can be resolved to two short and two long lifetime components. The two long

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