

476e Influence of Ammonia Vapor Post-Treatment on the Structure of Mesoporous Silica Prepared with Mixed Cationic and Glycoside Surfactants

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2D hexagonal-structured mesoporous silicas with variable pore sizes are synthesized by the "nanocasting" technique (polycondensation of tetramethoxysilane in concentrated acidic solutions with evaporation) using mixtures of cetyltrimethylammonium bromide (CTAB) and n-octyl- β -D-glucopyranoside (C_8G_1) as templates. The pore diameter can be tuned and controlled by post-treatment of as-made materials with ammonia vapor at a mild temperature of 50°C. Without ammonia treatment, the pore diameter remains constant as the glycoside surfactant content increases up to even a 0.3 C_8G_1 : 1 CTAB weight ratio. However, when the as-made materials are treated with ammonia vapor, the pore diameter of the product increases and the degree of long-range pore order decreases as the C_8G_1 content increases. Variation of the process parameters shows that the degree of pore swelling can be reduced by using less ammonia to reduce the driving force for swelling, or using more silica precursor to create thicker walls. Micelle swelling may occur with CTAB, but it is limited by rapid polycondensation of silica and favorable headgroup-silica interactions. We will show evidence that in the presence of the glucoside surfactant, the extent of swelling is greater not only because of a change in the physical interaction with silica, but also because the Maillard reaction occurs.