The adsorption properties of surface-modified mesoporous silica materials with ß-cylodextrin

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Abstrak

The adsorption properties of surface-modified mesoporous silica materials containing ?-cyclodextrin (CD ICS) were studied using two types of gas phase adsorbates (N2 and CH3Cl), along with a dye molecule (p-nitrophenol; PNP) in an aqueous solution. The CD ICS materials possess an ordered silica mesostructure framework that depends on the type of surfactant template and the level of loading of ?-CD. Incremental variations in the uptake of gas phase adsorbates and PNP from an aqueous solution were observed, according to the composition of CD ICS materials. For materials with similar CD loading, the surface area (SA) and pore volume doubled, as the surfactant from dodecylamine to hexadecylamine was varied. The SA of the CD ICS materials decreased by ca. 1.5-fold as the CD loading varied from 2% to 6%. The sorption capacity (Qe; mmol/g) of PNP increased from 61% to 84% as the CD loading increased from 2% to 6% and as the alkyl chain length of the surfactant template varied from C12 to C16. The adsorption properties of CD ICS materials with CH3Cl in the gas phase and for PNP in aqueous solution adopt a multi-layer adsorption profile, as described by the BET isotherm model.