

605g Bi-Functionalized Mesoporous Silica Synthesized Using Fluorinated Surfactants as Template

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The recent demonstration of cationic fluorocarbon surfactants for the templating of mesoporous silica is extended to organic-inorganic hybrids through direct synthesis. The potential to align functional group in the pores of the templated silica material through the interactions of the fluoro-surfactant tail and a fluoro-surfactant functional group is examined. Investigation of the direct synthesis of tridecafluoro(1H, 1H, 2H, 2H)octyl ($C_6F_{13}C_2H_4-$) functionalized porous silica materials using fluorocarbon surfactants ($C_6F_{13}C_2H_4NC_5H_5Cl$ and $C_8F_{17}C_2H_4NC_5H_5Cl$) as templates is described and extended to bi-functionalized materials. Incorporation of a second functional group (a reactive organic group) in addition to a fluorocarbon functional group could result in advanced materials for chromatography, sensing, and separations employing a low surface tension medium (e.g. fluorocarbon solvent or supercritical carbon dioxide) or a fluorine tagged reagent.

This work investigates the bi-organic (tridecafluoro(1H, 1H, 2H, 2H)octyl and aminopropyl) functionalization of mesoporous silica by direct synthesis using fluoro-surfactants ($C_6F_{13}C_2H_4NC_5H_5Cl$ and $C_8F_{17}C_2H_4NC_5H_5Cl$) or cetylpyridinium bromide ($C_{16}F_{33}NC_5H_5Br$: hydrocarbon analogue of the fluoro-surfactants) as templates. Incorporation of the organic groups is confirmed for both the hydrocarbon and fluorocarbon templated materials by FTIR and TGA analysis. The material order and structure are analyzed using X-ray diffraction and TEM, and the physical properties are obtained using nitrogen adsorption analysis. The accessibility of the reactive aminopropyl group was examined as a function of the surfactant template.