

Abstract

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Project Title: A Novel Route to Synthesize Ultra-Oleophobic Mesoporous Silica Nanoparticles

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Mesoporous silica nanoparticles (MSNPs) have been used in variety of applications due to their morphology and porous structure. This work reports the one-pot synthesis of ultrahydrophobic MSNPs using *N*-cetyl-*n,n,n*-trimethyl ammonium bromide as a cationic surfactant template and ethanol (EtOH) as a cosolvent to form mesopores in the MSNPs. The effects of EtOH on the size and the pore structure of the MSNPs were studied by scanning electron microscopy and transmission electron microscopy. The results show that an addition of EtOH led to an enlargement of the MSNPs and a change in pore structure from a lamellar structure to a radially oriented structure. Co-condensation with two different types of fluoroalkyl silanes; trimethyl(fluoromethyl)silane, and trichloro(1*H*,1*H*,2*H*,2*H*-perfluorooctyl)silane provided low surface energy MSNPs with a core-shell structure. An assembly on the surface of these F-MSNPs generated nanostructure surface roughness rendering an improvement in surface wettability with water contact angle of 158.6°, which is a characteristic of oleophobic and ultrahydrophobic material.

Keywords: Silica nanoparticle; Core-shell; Porous material; Hydrophobic; Self-assembly