Fluorescent Mesoporous Silica Nanoparticles

조은범*
서울과학기술대학교 정밀화학과
(echo@snut.ac.kr*)

Synthesis and characterization of ultrabright fluorescent mesoporous silica nanoparticles of various sizes loaded with different amounts of fluorescent dye (Rhodamine 6G) is presented. The R6G fluorescent dye is physically entrapped inside the nanochannels of the silica matrix created during templated sol-gel self assembly. Due to the specific nano-environment, the fluorescence of the encapsulated dye molecules remains unquenched up to very high concentrations, which results in relatively high fluorescence. The particle size (ranging from 20 – 50 nm) and dye loading (0.8 – 9.3 mg dye per g particles) are controlled by the sequential addition time lag and the concentration of several organotriethoxysilanes, which are co-precursors of silica. The quantum yields of the encapsulated dye are calculated in the range from 0.65 to 1.0. The relative brightness of a single mesoporous particle is equivalent to the fluorescence of 30 – 770 free non-dimerized R6G dye molecules in water, or to that of 1.5 – 39 CdSe/ZnS quantum dots. Despite the presence of some hydrophobic groups on the particles' surfaces, colloidal suspensions of the particles are relatively very stable as monitored for 120 days.