One-Pot Synthesis of Hollow Silica Spheres with Mesoporous Shell using Hybrid Microfluidic Devices

정웅찬[1,2], 양승만[1,2,*]
[1]KAIST 생명화학공학과; [2]광자유체집적소자연구단
(smyang@kaist.ac.kr*)

We demonstrate the one-step synthetic method of hollow silica spheres with mesoporous shell(HSSMS) via microfluidic emulsification technique. The microfluidic devices formed the monodisperse THF-rich droplets containing the pre-hydrolysed silica sol, Pluronic F127 as a structure-directing agent, and hydrophobic polymer such as polymethyl methacrylate (PMMA). The rapid diffusion of THF from the water phase to the continuous oil phase causes the phase separation of hydrophobic polymer in emulsion droplets. Further evaporation of water induces the self-assembly of Pluronic F127 used as template for sol-gel chemistry. High Resolution TEM images confirm that the shells of obtained particles have a well-ordered hexagonal mesostructure (with pore diameters of ~5 nm) as previously reported. We also investigated the additional role of Pluronic F127 as a barrier separating the inner core from the continuous phase. Depending on the concentration of Pluronic F127, we could observe various morphologies such as foam-like shells and hemispheres.