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Synthesis of Core-Shell Silica Nanoparticles with Hierarchically Bimodal Pore Structures

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Reflecting the growing importance of nanomaterials in science and technology, controlling the porosity combined with well-defined structural properties has been an ever-demanding pursuit in the related fields of frontier researches. A number of reports have focused on the synthesis of various nanoporous materials so far and, recently, the nanomaterials with multimodal porosity are getting an emerging importance due to their improved material properties compared with the mono porous materials. However, most of those materials are obtained in bulk phases while the spherical nanoparticles are one of the most practical platforms in a great number of applications. Here, we report on the synthesis of the core-shell silica nanoparticles with double mesoporous shells (DMSs). The DMS nsnoparticles are spherical and monodispersive and have two different mesoporous shells, i.e., the bimodal porosity. It is the first example of the core-shell silica nanoparticles with the different mesopores coexisting in the individual nanoparticles. Furthermore, the carbon and silica hollow capsules were also fabricated via a serial replication process.

Keywords: core-shell, nanoparticle, bimodal pore