Hollow Spheres of Mesoporous Silica and PMOs: Encapsulation and Catalysis Applications

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Recently we have successfully synthesized a PMO hollow sphere via the dual templating method [1]. PMO hollow spheres with highly ordered mesoporous wall structure, tunable particle size, and wall thickness can be synthesized such hollow spheres are promising for drug and biomolecular encapsulation, or as nanoreactors for biocatalytic reactions at the molecular levels. The introduction of superparamagnetic nanoparticles into the solid or hollow spheres of silica with size less than 200nm would lead to superior performance in catalysis and separation, resulting in an easy recovery of the particles. We have developed a method to make uniform magnetic nanoparticles with sizes smaller than 10 nm, and encapsulate them inside mesoporous matrix or hollow spheres [2]. A similar synthesis route was used to make uniform magnetic nanoparticles encapsulated in MCM-41 like silica nanoparticles [3], which are proven to be excellent separation medium for proteins.

In this talk, examples of bioseparation and enzyme immobilization in hollow spheres and nanoporous silicates will be presented. New catalysts for syngas to liquid fuel conversion based on mesoporous oxide and silicate nanocomposites developed in our labs will be also mentioned.

References: