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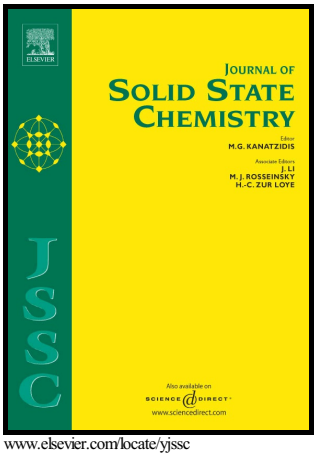

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Organosilane-assisted selective etching strategy for fabrication of hollow/rattle-type mesoporous organosilica nanospheres

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Abstract:

A facile strategy to fabricate hollow or rattle-type mesoporous silica nanospheres (HMSNs or RMSNs) with organic functional groups and porous shell was developed. Herein, thiol-HMSNs were obtained via treating vinyl-$SiO_{1.5}$@cyano&thiol-$SiO_{1.5}$ prepared by using 3-mercaptopropyltrimethoxysilane (MPTMS) as organosilane precursor, vinyltriethoxysilane (VTES) as sacrificial template precursor and cyanoethyltriethoxysilane (CTES) as pore-making agent. In this method, CTES was co-condensed with MPTMS to form hybrid shell and played an important role in the formation of pore structures. When the volume ratio of MPTMS to CTES was 1:1, well-defined thiol-HMSNs with a specific surface area of 295.6 $m^2 \cdot g^{-1}$ and pore volume of 0.51 $cm^3 \cdot g^{-1}$ could be obtained. Moreover, thiocyanato@thiol-RMSNs could also be synthesized through this method from three-layered structures (thiocyanato-$SiO_{1.5}$@vinyl-$SiO_{1.5}$@cyano&thiol-$SiO_{1.5}$). The as-prepared RMSNs presented good performance for the adsorption of 2, 4-dichloropheno in water. And this selective etching strategy was versatile and might be extended to fabricate more valuable organic hollow/rattle-type composites for different applications.

Graphical abstract

HMSNs and RMSNs with organic functional groups and porous shell were fabricated based on a facile oganosilica-assisted selective etching strategy. VTES and CTES were adopted as sacrificial template and pore-making agent, respectively. Both of them can were removed after alkali treatment, and hollow and mesoporous structure was further achieved synchronously.

[1] These authors contributed equally to this work