

研究论文

原位合成的活性脲醛树脂作为模板剂制备二氧化硅介孔材料

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摘要

利用酸性条件下正硅酸乙酯的水解和脲醛树脂的聚合反应同时一步原位进行的方法合成了二氧化硅复合粉体(包括核壳微球结构和网状结构)和块体凝胶材料.

液氮吸附BET分析结果证明复合材料焙烧后得到的二氧化硅孔径分布均匀, 大小在介孔范围内.

改变反应性单体尿素. 甲醛及正硅酸乙酯等的初始浓度可对二氧化硅块体材料的孔径大小进行调节.

扫描电子显微镜观测结果显示,

随着原料单体初始浓度的变化复合粉体材料的微米级形貌可以是多孔网状结构或核壳结构.

从红外光谱和差热分析的结果推测, 高甲醛/尿素摩尔比 $[n(\text{甲醛}): n(\text{尿素}) \geq 2]$

条件下形成的支链脲醛树脂可作为块体二氧化硅理想的孔结构导向剂.

关键词 [介孔二氧化硅](#) [模板剂](#) [脲醛树脂](#) [粉体](#) [块体](#)

分类号

Synthesis of Mesoporous Silica Materials Using the Reactive Urea-formaldehyde Resin Polymerized *in situ* as Template

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Abstract A simple one-step procedure was described for the synthesis of mesoporous monolith and composite sphere, in which hydrolyzation of tetraethyl orthosilicate and polymerization of urea with formaldehyde occurred at the same time. The analysis of the liquid nitrogen adsorption demonstrated that the pore sizes of the monoliths and the composite spheres were both uniform. Morphologies of the composite spheres characterized by SEM were smooth or of network, which depended on the relative concentrations of the reactants. As the molar ratio of formaldehyde to urea exceeded the limit of 2.0, the synthesis by varying initial concentration of the reactants yielded the monoliths with controllable pore sizes. From the analysis of the FTIR and DTA, the urea-formaldehyde resin with branched chains in its molecular structure was considered as an inducing agent in the pore formation of the monolith.

Key words [mesoporous silica](#) [template](#) [urea-formaldehyde resin](#) [composite powder](#) [monolith](#)

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