

FULL PAPERS

三维有序大孔SiO₂中的纳米银

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摘要 纳米银功能化的三维有序大孔(3DOM) SiO₂

在催化氧化过程有广泛应用前景。本文采用胶晶模板法制备了3DOM SiO₂,

继而以银镜反应在大孔内原位合成、附载银。XRD、TEM、SEM 测试表明, 银以金属纳米粒子形式分布于3DOM SiO₂孔表面, 银浴浓度低有利于得到粒子小、分布均匀的负载纳米银3DOM SiO₂材料,

附载量低的样品, 银粒子分散性高, 即使在 700 °C 焙烧,

仍未发生团聚。这一研究为合成不同附载量和形貌的Ag-3DOM SiO₂复合材料提供了一条新途径。

关键词 [银, SiO₂, 三维材料](#)

分类号

Fully Accessible Ag Nanoparticles within Three-dimensionally Ordered Macroporous SiO₂

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Abstract A multi-step process was used for preparation of three-dimensionally ordered macroporous (3DOM) SiO₂, in which fully accessible Ag nanoparticles are incorporated. The method involves the processes of assembly of polystyrene colloidal crystal, preparation of 3DOM SiO₂, and incorporation of Ag nanoparticles within 3DOM SiO₂ through *in situ* Tollens' reaction. XRD, SEM and EDXS determination show that the Ag particles deposited on the macroporous walls in nano dimension. The results indicate that lower concentration of silver ammoniate and formaldehyde in the solution is favorable for forming a very narrow size distribution and uniform shape of nanoparticles. However, the higher the concentration of the solution and the more the loading times, the larger the possibility to form un-uniform particles. Ag nanoparticles can be sintered into larger and spherical particles by calcination at 600 °C, but can resist sintering owing to their high dispersivity when loading amount is small. The study provided a simple approach to tailor Ag/3DOM SiO₂ composite materials with desired morphology and size of Ag particles within the macropores.

Key words [silver](#), [SiO₂](#), [three-dimensional material](#)

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