

浸渍-提拉法制备 PS胶晶模板及有序 ZnO多孔薄膜

李巍, 靳正国, 刘志锋, 杨建立, 邱继军

天津大学先进陶瓷与加工技术教育部重点实验室, 天津 300072

收稿日期 2005-3-31 修回日期 2005-5-23 网络版发布日期 接受日期

摘要 采用浸渍-提拉法制备聚苯乙烯微球(PS)模板, 以醋酸锌($Zn(CH_3COO)_2 \cdot 2H_2O$)、二乙醇胺($NH(C_2H_2OH)_2$)、乙醇和水等配制的前驱体溶胶填充PS模板间隙, 经过干燥过程原位形成凝胶, 最后通过煅烧除去PS微球模板得到有序规则排列的多孔ZnO薄膜. 重点讨论了模板在溶胶中的浸渍时间、溶胶的浓度对有序多孔结构形成的影响. 通过TG-DTA分析、XRD、TEM、SEM、IR反射光谱和UV-VIS光谱对结构和性能进行了表征. 结果表明, 用无皂聚合制备的PS直径约为400nm, IR反射光谱布拉格反射测定PS模板为fcc结构, 平行于基底的密排面为(111), ZnO由无定形向纤锌矿转变温度是460℃, 多孔薄膜的孔径约为280nm, 孔壁由晶粒直径约46nm的ZnO粒子构成, 透光率为60%, 禁带宽度 E_g 约为3.24eV.

关键词 [有序多孔ZnO薄膜](#) [PS模板](#) [无皂聚合](#) [浸渍-提拉法](#)

分类号 [TN304](#)

Preparation of Polystyrene Spheres (PS) Templates and Ordered Porous ZnO Films by Dip-coating

LI Wei, JIN Zheng-Guo, LIU Zhi-Feng, YANG Jian-Li, QIU Ji-Jun

Key Laboratory for Advanced Ceramics and Machining Technology of Ministry of Education, Tianjin University, Tianjin 300072, China

Abstract An organic template of monodisperse polystyrene spheres (PS) was prepared by a soap-free polymerization method. The spaces in the PS templates were filled by the sol synthesized by using $Zn(CH_3COO)_2 \cdot 2H_2O$, $NH(C_2H_2OH)_2$, ethanol and distilled water. The gelation of polystyrene/inorganic precursor was completed at room temperature. Ordered porous ZnO films were obtained after removing PS template by calcining. The influence of precursor concentration and dipping time on the arrangement of the pores was discussed. TG-DTA, XRD, TEM, SEM, IR reflection spectrum and UV-VIS spectrum were applied to characterize structures and properties of the films. The results show that the PS template has fcc structure in which the (111) plane is paralleled to substrate and the diameter of PS is 420nm. The transformation temperature of ZnO from amorphous to blende is 460℃. The diameter of the pores is about 280nm and the pore-wall is made up of ZnO grains with diameter of about 46nm. The transmissivity reaches 60%. E_g is 3.24eV.

Key words [ordered porous ZnO film](#) [PS template](#) [soap-free polymerization](#) [dip-coating method](#)

DOI:

通讯作者 李巍 liweil197812@126.com

扩展功能

本文信息

- ▶ [Supporting info](#)
- ▶ [PDF\(1227KB\)](#)
- ▶ [\[HTML全文\]\(0KB\)](#)
- ▶ [参考文献](#)

服务与反馈

- ▶ [把本文推荐给朋友](#)
- ▶ [加入我的书架](#)
- ▶ [加入引用管理器](#)
- ▶ [复制索引](#)
- ▶ [Email Alert](#)
- ▶ [文章反馈](#)
- ▶ [浏览反馈信息](#)

相关信息

- ▶ [本刊中 包含“有序多孔ZnO薄膜”的相关文章](#)
- ▶ [本文作者相关文章](#)

- [李巍](#)
- [靳正国](#)
- [刘志锋](#)
- [杨建立](#)
- [邱继军](#)