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研究论文

二氧化钛反蛋白石薄膜的制备及其在化学传感器中的应用

李建林[1,2]，刘全俊[2]，陈海华[2]，魏红梅[2]，顾忠泽*,[2,3]，陆祖宏*,[2]，谢笔钧[1]

([1]华中农业大学食品科技学院 武汉 430070)
([2]东南大学生物电子学国家重点实验室 南京 210096)
([3]南京大学固体微结构物理国家重点实验室 南京 210093)

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摘要 用提拉成膜法将单分散295 nm聚甲基丙烯酸甲酯(PMMA)胶体微球自组装成蛋白石光子晶体膜. 在PMMA蛋白石光子晶体膜的空隙里填充15 nm二氧化钛纳米颗粒, 经500 ℃的处理除去PMMA膜板, 制备出大面积, 结构均一的二氧化钛反蛋白石光子晶体膜. 扫描电子显微镜(SEM)观察和X射线光电能谱(XPS)分析表明, 这种二氧化钛反蛋白石光子晶体薄膜是六方紧密堆积. 用这种二氧化钛反蛋白石光子晶体膜对溶液折射率的检测实验表明该传感膜分辨率可达0.01.

关键词 反蛋白石光子晶体 二氧化钛 提拉法 传感

分类号

Fabrication of TiO_2 Inverse Opal Film and Its Ap-plication in Chemical Sensor

LI Jian-Lin[1,2], LIU Quan-Jun[2], CHEN Hai-Hua[2], WEI Hong-Mei[2], GU Zhong-Ze*,[2,3], LU Zu-Hong*,[2], XIE Bi-Jun[1]

([1] *College of Food Science and Technology, Huazhong Agriculture University, Wuhan 430070*)
([2] *State Key Laboratory of Bioelectronics, Southeast University, Nanjing 210096*)
([3] *Laboratory of Solid State Microstructures, Nanjing University, Nanjing 210093*)

Abstract A high quality ordered titanium dioxide (TiO_2) inverse opal film was fabricated by vertically lifting template method. First a substrate was lifted out of a particles suspension at the constant speed to fab-ricate a 295 nm poly (methyl methacrylate) (PMMA) opal film. Then the opal film was used as the template for the infiltration of titania nanoparticles with an aqueous suspension containing 10% 15-nm-titania-particles. Finally, the film was calcined at 500 ℃ to remove the polymer spheres and solidify the TiO_2 network structure. SEM images and XPS show that the TiO_2 inverse opal film with ordered structure was fabricated by this process. The conditions for the fabrication of ordered TiO_2 inverse opal film were discussed. Based on the Bragg's law, the ordered TiO_2 inverse opal films were successfully used as refractive index sensors with a resolution of 0.01.

Key words inverse opal titanium dioxide lifting method sensor

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通讯作者 顾忠泽 gu@seu.edu.cn