传感技术学报
中国微米纳米技术学会
全国高校传感技术研究会 主办

表面碳化的硅纳米孔柱阵列的H2S室温电容传感特性

作　者：王海燕, 王伶俐, 胡青飞, 李新建

单　位：郑州轻工业学院

基金项目：国家自然科学基金

摘　要：

通过将硅纳米孔柱阵列（Si-NPA）进行高温碳化处理，制备出一种SiC/Si-NPA复合纳米体系。对SiC/Si-NPA的表面形貌和结构表征揭示，生长于Si-NPA上的SiC薄膜由具有立方结构的SiC纳米颗粒组成，厚度为~200 nm。SiC/Si-NPA整体上保持了Si-NPA原有的柱状阵列结构特征。对浓度介于0-1200 ppm 的H2S气体的室温传感性能测试表明，SiC/Si-NPA对H2S气体的电容响应灵敏度可高达790%，而其对400 ppm浓度H2S气体的响应和恢复时间则分别为170秒和200秒，元件具有较好的测量重复性和稳定性。SiC/Si-NPA可能是一种室温条件下较为理想的H2S气体传感材料。

关键词：H2S气体传感器；SiC；硅纳米孔柱阵列；高温碳化

Room-temperature H2S capacitive sensing properties of surface- carbonized silicon nanoporous pillar array

Author's Name:

Institution:

Abstract:

Through a high-temperature thermal treatment process, the surface of silicon nanoporous pillar array (Si-NPA) was carbonized and a SiC/Si-NPA nanocomposite system was prepared. The characterization on the surface morphology and structure disclosed that the SiC film grown on Si-NPA was composed of cubic-structure SiC nanoparticles with a thickness of ~200 nm. The architectural feature of the regular pillar array for Si-NPA was remained in SiC/Si-NPA. The measurements on the room-temperature H2S sensing properties in a gas concentration range of 0-1200 ppm proved that the capacitive response sensitivity of SiC/Si-NPA to H2S could be as high as 790%, while the response and recovery times obtained for H2S gas with a concentration of 400 ppm were determined to be ~170 s and 200 s, respectively. The sensor exhibited an excellent measurement reproducibility and stability. Our results indicated that SiC/Si-NPA might be an ideal sensing material for developing H2S gas sensors being operated at room temperature.

Keywords: H2S gas sensor, SiC, silicon nanoporous pillar array, thermal carbonization

投稿时间：**2011-07-20**

查看pdf文件