

Fe₂O₃-In₂O₃复合薄膜光波导传感元件检测二甲苯气体的研究

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摘要:

摘要: 本文采用溶胶-凝胶法(sol-gel)制备出氧化铁-氧化铟复合材料,利用提拉法将复合材料固定在锡掺杂玻璃光波导表面研究出能够检测二甲苯气体的Fe₂O₃-In₂O₃复合薄膜/锡掺杂玻璃光波导气敏元件。将气敏元件固定在气体检测系统中对挥发性有机气体进行检测。实验结果表明, Fe₂O₃-In₂O₃复合薄膜/锡掺杂玻璃光波导气敏元件对二甲苯气体具有较好的响应, 其响应浓度范围为 $1 \times 10^{-3} \sim 1 \times 10^{-5}$ (V/V)。在常温下该敏感元件对于浓度为 1×10^{-5} (V/V)的二甲苯蒸汽有比较明显响应,其响应和恢复时间分别为5s和20s。Fe₂O₃-In₂O₃复合薄膜/锡掺杂玻璃光波导气敏元件具有灵敏度高、响应速度快、制作工艺简单和可逆性好等特点。

关键词: 关键词: 气体传感器1; 玻璃光波导2; 溶胶凝胶法3; Fe₂O₃-In₂O₃复合薄膜4; 二甲苯5;

Fe₂O₃-In₂O₃ Composite Thin Film Optical Waveguide Sensor For Xylene Gas Detection

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Abstract:

Abstract: This paper studied the gas sensitivity of a Fe₂O₃-In₂O₃ composite thin film/tin-diffused glass optical waveguide sensor. The sensitive element was synthesized by a sol-gel method. The sensor was fabricated by coating a tin-doped glass optical waveguide with a Fe₂O₃-In₂O₃ thin film. The optical waveguide sensor was fixed onto a gas sensor system to detect gaseous volatile organic compounds(VOCs). The results showed that the Fe₂O₃-In₂O₃ composite thin film/tin-diffused glass optical waveguide sensor showed high sensitivity towards xylene gas at room temperature and its detection range was $1 \times 10^{-3} \sim 1 \times 10^{-5}$ (volume fraction). it responded significantly to 1×10^{-5} (V/V) of xylene vapor and the response and recovery times were short (less than 5s and 20s, respectively). it had a short response time, high sensitivity, and good reversibility.

Keywords: Key words: gas sensor 1; glass optical waveguide 2; Sol-Gel method 3; Fe₂O₃-In₂O₃ Composite Film 4; xylene 5;

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