化学学报 2007 65 (6): 532—536 ISSN: 0567-7351 CN: 31-1320/06

研究论文

基于TiO_2-Y_2O_3粉体催化发光甲醇气体传感器的研究

饶志明*, 谢静宜, 刘林洁, 曾玉云, 蔡文联

(漳州师范学院化学与环境科学系 漳州 363000)

收稿日期 2006-7-11 修回日期 2006-10-8 网络版发布日期 2007-3-16 接受日期 2006-11-8

摘要 发现当甲醇气体通过TiO_2-Y_2O_3 (质量比为3∶1)粉体表面时, 可被空气中的O_2催化氧化产生强烈的化学发光, 基于此研制了一种新型的甲醇气体传感器. 此传感器对甲醇的检测具有较高灵敏度和较强的选择性. 在波长490 nm处进行定量分析, 催化发光强度与甲醇浓度在一定范围内呈良好的线性关系, 其线性范围为25.74～12870 mg/m^3 (r＝0.9995, n＝8); 检出限为8.58 mg/m^3(信噪比＝3). 外来物质如正己烷、三氯甲烷、苯、无水乙醇、甲醛、丙酮、氨、甲苯与甲醇共存时, 除了丙酮、乙醇和氨分别引起干扰外, 苯与其它气体不干扰测定. 该传感器工作时间可持续80 h以上, 是一种长寿命的、性能稳定的气体传感器, 并成功地实现了对甲醇气体的实时在线检测.

关键词 催化发光 甲醇 气体传感器 TiO_2-Y_2O_3粉体

分类号

Study on Gaseous Methanol Sensor Utilizing Cataluminescence of TiO_2-Y_2O_3 Powder

RAO Zhi-Ming*, XIE Jing-Yi, LIU Lin-Jie, ZENG Yu-Yun, CAI Wen-Lian

(*Department of Chemistry and Environmental Science, Zhangzhou Normal College, Zhangzhou 363000*)

Abstract When it passed over the surface of TiO_2-Y_2O_3 with the mass ratio of 3∶1, methanol gas was catalytically oxidized by O_2 in air that resulted in intensive chemiluminescence (CL). A novel methanol gas sensor based on this kind of CL was developed. The results showed that the sensor was of high sensitivity and selectivity to the determination of methanol gas. Quantitative analysis was performed at the wavelength of 490 nm. Under the optimized conditions, the linear range of cataluminescent (CTL) intensity versus concentration of methanol vapor was from 25.74 to 12870 mg/m^3 (r＝0.9995, n＝8), with a detection limit of 8.58 mg/m^3 (the signal-to-noise ratio was 3). No interference signals were observed while the added substances passed through the sensor, such as cyclohexane, *n*-hexane, chloroform, benzene, ethanol, formaldehyde, acetone, ammonia and toluene, except acetone, ethanol and ammonia. The gas sensor could be working for more than 80 h and showed the longevity and steady performance and was applied to the online determination of methanol successfully.

Key words cataluminescence methanol gas sensor TiO_2-Y_2O_3 powder

DOI:

通讯作者 饶志明 raozhm@163.com