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论文

四聚噻吩的单层组装及其对气相甲醛的传感性能

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摘要:

以荧光活性2,2':5',2"':5",2"'-四聚噻吩(4T)为传感元素, 经过化学键合将其单层组装到玻璃基质表面, 得到一种荧光薄膜材料. 研究发现, 光照下固定化4T在空气中易被氧化, 薄膜荧光因而减弱. 然而, 将此薄膜经紫外光照处理1 h后, 薄膜荧光虽然大大减弱, 但不再随着时间发生变化. 气态甲醛的存在会显著敏化薄膜荧光, 在原荧光发射的短波方向(464 nm)产生新的荧光发射. 该处荧光强度随着气相甲醛浓度增大而增强. 特别需要指出的是, 常见酸、碱和溶剂对甲醛传感均不产生明显影响, 而且传感过程完全可逆. 据此, 认为该薄膜在甲醛气相检测中有可能获得应用.

关键词: 四聚噻吩; 甲醛; 荧光敏化; 荧光薄膜

Preparation and Sensing Performance to Formaldehyde Vapor of Quaterthiophene-Based Fluorescent Films

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Abstract:

A fluorescent film was fabricated by chemical immobilization of 2,2':5',2"':5",2"'-quaterthiophene(4T), which was employed as a sensing element, onto an amine-terminated glass wafer surface. It has been demonstrated that the fluorescence emission of the film is not stable in air, and it decreases along with increasing scanning time. However, the emission can be stabilized by treatment of the film under UV light irradiation in air. It was found with interesting that a new emission($\lambda_{em}=464$ nm) appears after divulging the film in formaldehyde vapor. The intensity of the emission increases along with increasing the exposure time. Further experiments reveal that the fluorescence sensitization is fully reversible and highly selective. Common acids, ammonia and alcohols have little effect upon the fluorescent emission of the film. Therefore, it is anticipated that the film may be developed into a formaldehyde sensor. In addition, a possible sensing mechanism was proposed according to known photochemistry of oligothiophene and the experimental results from present study.

Keywords:

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