

基于Silicate-1型分子筛修饰的QCM类神经毒气传感器

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摘要:

本文主要研究Silicate-1型纳米分子筛对类神经毒气有机气体甲基磷酸二甲酯(DMMP)的敏感特性,并结合高灵敏度的石英谐振天平(QCM)研制了DMMP气体传感器。采用Silicate-1型纳米分子筛作为敏感膜材料分别对不同浓度的DMMP气体进行检测。QCM传感器随着气体浓度的增加,响应时间增加,气体吸附量增加;当DMMP浓度为50ppm, QCM响应频率为50Hz。分别采用水汽, 300ppmCO₂和500ppmNH₃作为干扰气体对该敏感膜材料选择性进行了研究, QCM的响应频率分别为178 Hz, 28Hz和15Hz。本实验采用交变电场作用下N₂吹洗脱附,在60s以内就可以达到85%以上的脱附率。

关键词: Silicate-1分子筛; QCM; DMMP; 气敏传感器

QCM Gas Sensor Based on Modified Silicate-1 Zeolite for the Nerve Agent Simulant DMMP Detection

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Abstract:

A new quartz crystal microbalance (QCM) gas sensor based on the silicate-1 zeolite film is introduced in this paper. The sensitive characteristics to the nerve agent sarin stimulant dimethylmethylphosphonate(DMMP) of the gas sensor have been systematically studied. Different concentration DMMP are detected by the sensor. As the concentration of DMMP increases, the response time increases, and the absorbed capability of QCM sensor increases. The delta frequency of QCM is 50Hz to 50 ppm DMMP. In order to test the selectivity of the gas sensor, Water vapor, 300 ppm CO₂ and 500 ppm NH₃ are used as interfering gases. The delta frequencies of QCM to these gases are 178Hz, 28Hz and 15Hz. In 60 seconds the gas sensor obtained 85% desorption ratio by alternating field with 99.999% N₂ blow-washing in this experiment.

Keywords: gas sensor; Silicate-1 zeolite; QCM; DMMP;

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