

基于MWCNTs/Nafion复合膜的高性能声表面波湿敏传感器研究

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摘要:

湿度检测广泛应用于工业、医疗等各个领域, 对高性能湿度传感器的需求日趋迫切。首先对声表面波传感器敏感机理进行了深入的分析, 得到影响其性能的主要因素。在此基础上研制出一种以多壁碳纳米管(MWCNTs)和Nafion 复合材料为湿敏膜, 高频声表面波谐振器为换能元件的高性能湿敏传感器。实验表明, 制得的湿敏传感器在宽湿度范围内(10%RH-80%RH)具有很高的检测灵敏度(大于300kHz%RH), 良好的线性度及快速的响应速度(<10s)。并通过实验结果进一步讨论了复合材料中MWCNTs和Nafion对传感器性能的影响。

关键词: 湿敏传感器; 声表面波; 复合材料; 碳纳米管

An excellent humidity sensor made of surface acoustic wave resonator coated with MWCNTs/Nafion composite material films

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Abstract:

Humidity detection has been widely used in variety of fields. The demand for various humidity sensors with excellent performance is becoming more and more urgent. A penetrating research was done to analyze the sensitive mechanism of the surface acoustic wave (SAW) sensor and to find its key influence factors. Based on the research conclusion, a novel humidity sensor with excellent performance was made of surface acoustic wave resonator (SAWR) coated with multi-walled carbon nanotubes/Nafion (MWCNTs/Nafion) composite material as humidity sensing films. The present sensor showed quite a high sensitivity above 300 kHz/%RH in the range from 10%RH to 80% RH. At the same time, both linearity and response time of the sensor were also improved. The different effect of MWCNTs and Nafion in the composite film was discussed based on the experiment result.

Keywords: humidity sensor; surface acoustic wave (SAW); Composite material; CNTs

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