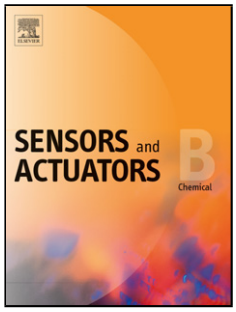

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PII: S0925-4005(18)30641-5
DOI: https://doi.org/10.1016/j.snb.2018.03.143
Reference: SNB 24428

To appear in: *Sensors and Actuators B*

Received date: 1-7-2017
Revised date: 4-3-2018
Accepted date: 23-3-2018

Please cite this article as: Xing Ding, Xiangdong Chen, Xinpeng Chen, Xuan Zhao, Ning Li, A QCM humidity sensor based on fullerene/graphene oxide nanocomposites with high quality factor, Sensors and Actuators B: Chemical https://doi.org/10.1016/j.snb.2018.03.143

A QCM humidity sensor based on fullerene/graphene oxide nanocomposites with high quality factor

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Highlights

- A C_{60}/GO coated QCM humidity sensor with high quality factor was constructed.
- It was proved that the GO film was viscoelastic and Sauerbrey relationship was not suitable for a GO coated QCM humidity sensor even at a low relative humidity level.
- The proposed sensor showed better performances at quality factor and dynamic response-recovery behavior than the GO based QCM humidity sensor.

Abstract

This paper described a quartz crystal microbalance (QCM) humidity sensor based on fullerene (C_{60})/graphene oxide (GO) nanocomposites. Humidity sensing properties such as the quality factor, frequency response property, response/recovery time, and humidity hysteresis were measured and quantitatively compared with a GO based QCM humidity sensor. The experiments provided evidences that the GO film was viscous even at low relative humidity, which had a large impact on the measurable result of a GO coated QCM humidity sensor. As a result, the proposed sensor showed better performances at quality factor and dynamic response/recovery behavior than the GO based QCM humidity sensor. Based on the admittance analysis and frequency response analysis of the sensors, it was speculated that the introduction of C_{60} molecules into GO reduced the aggregation of the GO sheets and formed some hydrophobic isolation layers between the GO sheets, which could inhibit the water molecules permeation and maintain the mechanical stiffness of the C_{60}/GO film.