Document details

‹ Back to results | 1 of 1

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Effect of chitosan dissolved in different acetic acid concentration towards VOC sensing performance of quartz crystal microbalance overlay with chitosan (Article)

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Abstract

View references (12)

Improvement in sensing layer properties of quartz crystal microbalance (QCM) sensors are crucial in developing gas sensors with high sensitivity and selectivity. In this work, we study the use of chitosan thin film as the sensing layer on a QCM sensor to identify the presence of volatile organic compounds specifically isopropyl alcohol (IPA). The effect of chitosan dissolved in different acetic acid concentrations towards QCM overlay with chitosan sensing performance were studied. Characterization work on chitosan thin film at different acetic acid concentrations (1.0, 1.5, 2.0, 2.5% (v/v)) were performed by using FTIR and FESEM. Higher acid concentration led to a higher degree of protonation which results in a more progressive solubilization of chitosan and promotes smoother film. For chitosan layer dissolved in 2% acetic acid , the highest resonance frequency shift (99.3 Hz) was observed during the adsorption of the analyte gas molecules on QCM sensors. This can be explained by the increase in chitosan solubility and protonation. This indicates that difference acid concentration in chitosan dissolution affects the sensing performance during the presence of the analyte gas. © 2021 Elsevier B.V.

SciVal Topic Prominence

Topic: Quartz Crystal Microbalances | Organic Liquids | Piezoelectric Crystals

Prominence percentile: 48.867

Author keywords

Biopolymers | Chitosan | Frequency shift | Piezoelectric | QCM sensor

Indexed keywords

Engineering controlled terms: Acetic acid | Chemical sensors | Chitosan | Crystals | Dissolution | pH | Protonation | Quartz | Solubility | Thin films | Volatile organic compounds

Engineering uncontrolled terms: Acetic acid concentration; Acid concentrations; Degree of protonation; High sensitivity; Isopropyl alcohols; Quartz crystal microbalance sensors; Resonance frequency shift; Sensing performance

Engineering main heading: Quartz crystal microbalances

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Back to results | 1 of 1 Top of page