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Chitosan Coating on Quartz Crystal Microbalance Gas Sensor for Isopropyl Alcohol and Acetone Detection

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Abstract

The development of acoustic wave sensors was driven by the presence of modern technology. Quartz crystal microbalance (QCM) has excellent sensing capabilities and has wide range of applications. Selection of sensing layer is crucial to ensure the performance of the QCM sensor for volatile organic compound (VOC) detection. Hence, the objective of this paper is to compare the performance of chitosan coated QCM sensor for different analyte gas: isopropyl alcohol (IPA). Finite element simulation was implemented using COMSOL Multiphysics to study the resonance frequency shift before and after sensing. Simulation results shows IPA detection shows a higher resonance frequency shift of 62.5 Hz compared to acetone due to higher molar mass. Experimental work is conducted to validate the simulation results where IPA analyte gas yields in 84.8 Hz which is higher than acetone analyte gas at 41.8 Hz. The functional groups for both sensing layer and analyte gas also affects the gas detection performance. IPA analyte gas possessed hydroxyl groups that favors to hydrogen bond formation with chitosan sensing layer. Thus, the QCM sensor with chitosan as the sensing layer has the potential for VOC sensing of different molar mass and functional groups. © Universiti Tun Hussein Onn Malaysia Publisher's Office

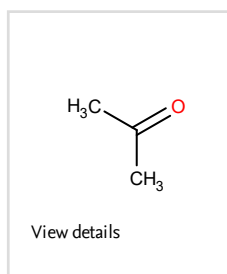
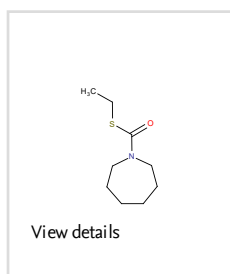
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