

INTISARI

PEMANFAATAN SENSOR *QUARTZ CRYSTAL MICROBALANCE* DENGAN LAPISAN *NANOFIBER POLYVINYL ACETATE/CITRIC ACID* UNTUK PEMANTAUAN PERUBAHAN KONSENTRASI GAS AMONIA OLEH TANAMAN *SPATHIPHYLLUM*

Oleh

Khalid Saifullah
18/424142/PA/18247

Deteksi kandungan gas amonia di daerah pertanian penting untuk dilakukan untuk meningkatkan efisiensi penggunaan pupuk berbahan dasar nitrogen. Kandungan amonia di atmosfer terus meningkat terutama di daerah pertanian. Amonia dapat menimbulkan iritasi pada mata, kulit, dan organ pernapasan manusia. Deteksi gas amonia sebelumnya telah dilakukan dengan metode spektrometer, metode pemompaan, kromatografi, dan tabung deteksi gas. Namun dibutuhkan metode deteksi dengan biaya yang rendah, mudah, dan cepat. Kegiatan pemantauan kandungan gas amonia di atmosfer dapat diawali dengan meneliti pengaruh tanaman terhadap kandungan gas amonia di udara. Pada penelitian ini efek tanaman *Spathiphyllum* terhadap kandungan gas amonia akan diamati dengan menggunakan sensor berbasis *quartz crystal microbalance* (QCM). QCM dilapisi dengan *nanofiber polyvinyl acetate/citric acid* (PVAc/CA) menggunakan metode pelapisan *electrospinning* agar sensitif dan selektif terhadap gas amonia. Hasil penelitian menunjukkan sensitivitas sensor terhadap gas amonia sebesar 4,32 Hz/ppm dengan waktu respons dan waktu pemulihan sebesar 8,67 dan 50,33 detik. Pengujian terhadap bagian tanaman menggunakan sensor QCM menghasilkan penurunan frekuensi pada sensor QCM PVAc dan PVAc/CA. Sensor QCM dengan lapisan PVAc/CA memberikan nilai respons yang lebih besar bila dibandingkan dengan lapisan PVAc. Penurunan frekuensi kemungkinan diakibatkan oleh *volatile organic compound* (VOC) yang dihasilkan oleh tanaman *Spathiphyllum*. Senyawa β -costol dan (Z)-linalool oxide kemungkinan berinteraksi dengan gugus hidroksil sehingga menyebabkan penurunan frekuensi sensor QCM PVAc/CA. Penurunan frekuensi per satuan luas diurutkan dari yang terbesar diakibatkan berturut-turut oleh bagian akar, batang, dan daun. Penelitian lanjutan perlu dilakukan untuk mengetahui pengaruh berbagai macam VOC hasil emisi dari tanaman yang dapat mempengaruhi nilai respons sensor QCM PVAc/CA terhadap kandungan gas amonia

Kata kunci : *sensor, quartz crystal microbalance, polyvinyl acetate, citric acid, ammonia, electrospinning, spathiphyllum*

ABSTRACT

UTILIZATION OF QUARTZ CRYSTAL MICROBALANCE SENSOR WITH POLYVINYL ACETATE/CITRIC ACID NANOFIBER LAYER FOR MONITORING CHANGES OF GASEOUS AMMONIA CONCENTRATION BY SPATHIPHYLLUM PLANT

By

Khalid Saifullah
18/424142/PA/18247

Detection of ammonia vapor content in agricultural areas is important to do to increase the efficiency of using nitrogen-based fertilizers. Ammonia in the atmosphere continues to increase, especially in agricultural areas. Ammonia can cause irritation to the eyes, skin and respiratory organs of humans. Ammonia gas detection has previously been carried out by spectrometer methods, pumping methods, chromatography, and gas detection tubes. However, a low-cost, easy, and fast detection method is needed. The monitoring the content of ammonia vapor in the atmosphere can be started by examining the effect of plants on the ammonia gas in the air. In this study the effect of *Spathiphyllum* plants on ammonia gas content will be observed using a quartz crystal microbalance (QCM) sensor. QCM is coated with polyvinyl acetate/citric acid (PVAc/CA) nanofibers with electrospinning method to be sensitive and selective to ammonia gas. The results showed that the sensor sensitivity to ammonia gas was 4.32 Hz/ppm with response and recovery times of 8.67 and 50.33 seconds. Tests on plant parts using the QCM sensor resulted in a decrease in frequency on QCM PVAc and PVAc/CA sensor. QCM sensor coated with PVAc/CA nanofiber gives a greater response value when compared to the PVAc layer. The decrease in frequency is probably due to the volatile organic compound (VOC) produced by the *Spathiphyllum* plant. The β -costol and (Z)-linalool oxide compounds may interact with the hydroxyl groups causing a decrease in the frequency of the PVAc/CA QCM sensor. The decrease in frequency per unit area sorted from the largest is caused by the roots, stems and leaves, respectively. Further research needs to be done regarding the influence of various VOC emissions from plants that can affect the response value of the QCM PVAc/CA sensor to the ammonia gas content.

Keywords : *sensor, quartz crystal microbalance, polyvinyl acetate, citric acid, ammonia, electrospinning, spathiphyllum*