

INTISARI

FABRIKASI DAN KARAKTERISASI SENSOR AMONIA BERBASIS QUARTZ CRYSTAL MICROBALANCE DENGAN METODE MOLECULAR IMPRINTING PADA POLYVINYL ACETATE/ASAM BORAT

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Keberadaan salah satu senyawa organik mudah menguap (VOC) amonia yang menjadi prekursor utama pada pasien gagal ginjal dapat ditemukan melalui sistem pendeteksian gas amonia pada uap nafas manusia. Sistem deteksi gas amonia menjadi penting untuk mengawasi jumlah kandungan amonia dalam tubuh melalui hembusan nafas manusia sehingga gejala atau komplikasi yang lebih parah dapat dihindari. Oleh karena itu, pada penelitian ini dilakukan pengembangan sensor deteksi amonia menggunakan *Molecular Imprinting Polymer* (MIP) berbasis *Quartz Crystal Microbalance* (QCM) dengan polimer *Polyvinyl Acetate/Boric Acid*. Sintesis MIP dilakukan dengan polimer PVAc 15%, *template* amonia 1%, , variasi penambahan *Boric Acid* , metode pelapisan *electrospinning*, pelepasan *template* dengan pemanasan, dan uji karakteristik sensor. Variasi konsentrasi *Boric Acid* yang ditambahkan yaitu sebesar 2% , 4%, dan 6% (v/v). Hasil pengujian menunjukkan sensor QCM MIP PVAc dengan penambahan *Boric Acid* 6% memiliki sensitivitas 0,10949 Hz/ppm atau 2 kali lebih tinggi dibandingkan sensitivitas QCM MIP PVAc tanpa penambahan *Boric Acid* . Sensor QCM PVAc MIP dengan doping *Boric Acid* 6% juga memiliki tingkat stabilitas yang baik, reproduksibilitas yang tinggi dengan selisih maksimal 0,7% dan selektivitas yang tinggi terhadap amonia dibandingkan *ethanol*, *methanol*, *acetone*, dan *benzene*. Dengan batas deteksi sensor (LOD) terhadap gas amonia mencapai 53,1 ppm dan batas ketelitian (LOQ) 17,5 ppm. Sensitivitas dan selektivitas yang tinggi terhadap amonia disebabkan adanya ikatan kovalen kordinasi antara atom boron dari *Boric Acid* dan atom nitrogen milik amonia pada setiap molekul cetakan yang dihasilkan.

Kata kunci : *Quartz Crystal Microbalance* (QCM) , *Molecular Imprinting Polymer* (MIP), PVAc, *Boric Acid*, amonia

ABSTRACT

FABRICATION AND CHARACTERIZATION OF AMMONIA SENSOR BASED ON QUARTZ CRYSTAL MICROBALANCE USING MOLECULAR IMPRINTING METHOD ON POLYVINYL ACETATE/BORIC ACID

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The presence of one of the volatile organic compounds (VOC) of ammonia, which is the main precursor in kidney failure patients can be found through the detection system of ammonia gas in human breath vapors. The ammonia gas detection system is important to monitor the amount of ammonia content in the body through human breaths so that more severe symptoms or complications can be avoided. Therefore, in this research, the development of ammonia detection sensors using Molecular Imprinting Polymer (MIP) based on Quartz Crystal Microbalance (QCM) with Polyvinyl Acetate / Boric Acid polymer was carried out. The MIP synthesis was carried out with 15% PVAc polymer, 1% ammonia template, variations in addition of Boric Acid, electrospinning coating method, template removal by heating, and sensor characteristic tests. The variations in the concentration of boric acid added were 2%, 4%, and 6% (v / v). Research results show that the QCM MIP PVAc sensor with the addition of 6% Boric Acid has a sensitivity of 0.10949 Hz/ppm or 2 times higher than the sensitivity of the QCM MIP PVAc without the addition of Boric Acid. The QCM PVAc MIP sensor with 6% Boric Acid doping also has a good level of stability, high reproducibility with a maximum difference of 0.7% and high selectivity to ammonia compared to ethanol, methanol, acetone, and benzene. With sensor detection limit (LOD) for ammonia gas reaching 53.1 ppm and accuracy limit (LOQ) 17.5 ppm. The high sensitivity and selectivity to ammonia is due to the presence of a coordinating covalent bond between the boron atom of Boric Acid and the nitrogen atom of ammonia in each resulting mold molecule.

Keywords : Quartz Crystal Microbalance (QCM) , Molecular Imprinting Polymer (MIP), PVAc, Boric Acid, ammonia