

ABSTRAK

Penelitian ini mengembangkan elektroda selektif berbasis *Polimer Inclusion Membrane* (PIM) dengan polieugenol sebagai senyawa aktif dan Di-(2-Ethyl Hexyl) Phosphoric Acid (D₂EHPA) sebagai pembawa ion untuk mendeteksi kadar urea secara potensiometri. Pembuatan elektroda diawali dengan polimerisasi eugenol menggunakan katalis BF₃-dietileter, dilanjutkan dengan sintesis PIM yang mengandung D₂EHPA, serta optimasi ketebalan membran dan pH larutan sampel. Hasil karakterisasi menggunakan FTIR menunjukkan hilangnya pita serapan alil dan vinil, menandakan polimerisasi eugenol berhasil. Polieugenol berbentuk serbuk oranye dengan rendemen 95,87% dan berat molekul 30199,5172 g/mol. Elektroda optimal dengan ketebalan 0,3 mm dan komposisi PVC, polieugenol, DBE, dan D₂EHPA menghasilkan faktor Nernst 29,304 mV per dekade pada pH 5, linearitas 0,997, serta rentang pengukuran 10⁻⁸ hingga 10⁻² M dengan batas deteksi 5,9841 × 10⁻⁸ M. Akurasi mencapai 101% dan presisi memiliki koefisien variasi 1,145%. Selektivitas elektroda terhadap kreatinin berada pada koefisien 2,69 × 10⁻⁶ (10⁻¹ M) dan 7,36 × 10⁻⁶ (10⁻² M). Pengukuran kadar urea dalam urin dengan metode potensiometri menunjukkan 146,747 ppm pada pria dan 60,388 ppm pada wanita, sejalan dengan hasil pengukuran spektrofotometer UV-Vis yang menunjukkan 104,18 ppm pada pria dan 105,62 ppm pada wanita. Hasil ini menunjukkan bahwa elektroda ini mampu mengukur urea secara selektif dalam larutan maupun sampel urin.

Kata kunci: *Polimer Inclusion Membran*, D₂EHPA, ESI Potensiometri

ABSTRACT

This study developed a selective electrode based on Polymer Inclusion Membrane (PIM) with polyeugenol as the active compound and Di-(2-Ethyl Hexyl) Phosphoric Acid (D2EHPA) as the ion carrier to detect urea levels potentiometrically. The electrode preparation began with the polymerization of eugenol using BF₃-diethylether catalyst, followed by the synthesis of PIM containing D2EHPA, and optimization of the membrane thickness and pH of the sample solution. The characterization results using FTIR showed the disappearance of allyl and vinyl absorption bands, indicating that the eugenol polymerization was successful. Polyeugenol was in the form of orange powder with a yield of 95.87% and a molecular weight of 30199.5172 g/mol. The optimal electrode with a thickness of 0.3 mm and a composition of PVC, polyeugenol, DBE, and D2EHPA produced a Nernst factor of 29.304 mV per decade at pH 5, a linearity of 0.997, and a measurement range of 10⁻⁸ to 10⁻² M with a detection limit of 5.9841 × 10⁻⁸ M. The accuracy reached 101% and the precision had a coefficient of variation of 1.145%. The selectivity of the electrode to creatinine was at a coefficient of 2.69 × 10⁻⁶ (10⁻¹ M) and 7.36 × 10⁻⁶ (10⁻² M). Measurement of urea levels in urine using the potentiometric method showed 146.747 ppm in men and 60.388 ppm in women, in line with the results of UV-Vis spectrophotometer measurements which showed 104.18 ppm in men and 105.62 ppm in women. These results indicate that this electrode is able to selectively measure urea in solutions and urine samples.

Keywords: Polymer Inclusion Membrane, D2EHPA, ESI Potentiometry