Fitriany, Erna, 2019, Analisis Voltammetri secara Simultan Campuran Dopamin dan Asam Urat menggunakan Elektroda CPE/PM/AuNPs, Tesis ini bawah bimbingan Dr. Muji Harsini, M. Si, dan Prof. Dr. Afaf Baktir, MS., Departemen Kimia, Fakultas Sains dan Teknologi, Universitas Airlangga.

ABSTRAK

Modifikasi elektroda pasta karbon (CPE) dengan menggunakan polimelamin (PM) dan nanopartikel emas (AuNPs) telah dilakukan melalui elektropolimerisasi larutan melamin dan elektrodeposisi larutan emas pada permukaan elektroda CPE secara voltammetri siklis (CV). Elektroda ini selanjutnya digunakan untuk analisis secara simultan dopamin (DA) dan asam urat (UA), baik secara CV maupun voltammetri pulsa differensial (DPV). Hasil karakterisasi morfologi permukaan CPE/PM/AuNPs dengan SEM menunjukkan bahwa AuNPs terkumpul membentuk partikel lebih besar tidak beraturan yang tersebar secara tidak merata pada pemukaan elektroda. Data EDX menunjukkan bahwa permukaan elektroda telah terlapisi AuNPs dengan konsentrasi Au 13,17%, sedangkan atom lainnya yaitu C, O, dan N berturut-turut adalah 69,69; 13,03; dan 1,69 %. Luas permukaan efektif elektroda CPE/PM/AuNPs (0,42 cm^2) adalah 4,5 kali lebih luas jika dibandingkan dengan elektroda CPE (0,09 cm^2). Elektroda CPE/PM/AuNPs memiliki aktivitas elektrokatalitik yang bagus dalam oksidasi dopamin menjadi dopamin quinon dan oksidasi asam urat menjadi asam urat-4,5-diol pada bufer 0,1 M (pH 3). Teknik DPV digunakan untuk penentuan rentang linearitas, limit deteksi (LOD), sensitivitas, presisi, akurasi dan selektivitas elektroda CPE/PM/AuNPs. Didapatkan rentang linaeritas 0,7 µM - 14 µM; LOD untuk DA sebesar 0,6052 µM dan untuk UA sebesar 0,6462 µM; senstivitas sebesar 5,8156 µA untuk DA dan 5,6964 µA untuk UA; presisi sebesar 0,0053- 0,0523% untuk DA dan 0,0020-0,0197% untuk UA; akurasi sebesar 83,0770- 108,5530% untuk DA dan 91,4657-102,4810% untuk UA. Pada analisis urin bayi yang *dispike* dopamine dan asam urat konsentrasi tertentu menunjukkan *recovery* sebesar 98,9990% untuk DA dan 98,9690% untuk UA. Elektroda ini memberikan voltammogram DPV dengan pemisahan potensial puncak yang sempurna pada analisis campuran DA, UA, dan asam askorbat (AA).

Kata Kunci: dopamin, asam urat, polimelamin, nanopartikel emas, voltammetri

Fitriany, Erna, 2019, Simultaneous Voltammetry Analysis of Dopamine and Uric Acid using PM/AuNPs/CPE, This thesis was under guidance of Dr. Muji Harsini, M. Si, and Prof. Dr. Afaf Baktir, MS., Department of Chemistry, Faculty of Science and Technology, Airlangga University.

ABSTRACT

Modification of carbon paste electrode (CPE) using polymelamine (PM) and gold nanoparticle (AuNPs) was developed by electropolymerization and electrodeposition on the surface of CPE by cyclic voltammetry (CV). This electrode used for simultaneous analysis of dopamine (DA) and uric acid (UA) by CV and different pulse voltammetry (DPV). The morphology surface of CPE/PM/AuNPs was studied using SEM-EDX, the AuNPs form larger irregular particles which spread on the electrode surface. EDX data shows that the surface of the electrode has been coated with AuNPs, the concentration were 13, 17% of Au, while other atoms such as C, O, and N were respectively 69,69; 13,03; and 1,69%. The active surface area of CPE/PM/AuNPs (0,4169cm^2) is 4,5 times higher than CPE (0,0935 cm^2). CPE/PM/AuNPs have good electrocatalytic activity for dopamin oxidation and UA oxidation in buffer phospate solution 0,1 M (pH 3). The DPV technique was used for determining the linearity, limit of detection (LOD), sensitivity, precision, accuracy, and selectivity of CPE/PM/AuNPs. The linearity range is 0,7μM – 14 μM; LOD for DA is 0,6052 μM and for UA is 0,6462 μM; the sensitivity is 5,8156 μA for DA and 5,6964 μA for UA; the precision is 0,0053-0,0523% for DA and 0,0020- 00197% for UA; the accuracy is 83,0770- 108,5530% for DA and 91,4657 – 102,4810% for UA. In the real sample analysis using baby's urine, the sample was spiked with DA and UA, the recovery is 98,89% for DA and 98,97% for UA. This electrode showed a DPV voltammogram with perfect peak potential separation in the analysis of the mixture of DA, UA, and ascorbic acid (AA).

Key Word : dopamine, uric acid, polymelamine, gold nanoparticle, voltammetry

DAFTAR ISI

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