

ELECTROCHEMICAL DETECTION OF DOPAMINE IN PRESENCE OF URIC ACID USING A ZIRCONIA MODIFIED CARBON PASTE ELECTRODE

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ABSTRACT

A Sensitive and selective electrochemical sensor was developed by modifying carbon paste electrode (MCPE) with Zirconia for the simultaneous determination of dopamine (DA) in the presence of excess concentration of uric acid (UA) in 0.1 M phosphate buffer solution (PBS) at pH 7.0 with a scan rate of 50 mVs⁻¹. Cyclic and differential pulse voltammetric techniques were carried out to study the electrochemical properties of modified electrode. The parameters including carbon paste composition, scan rate, electrode potential and pH were studied. The oxidation peak potential of UA exhibited a negative shift due to the electrostatic repulsions of anionic species with zirconia modified carbon paste electrode (ZMCPE). A four fold enhancement in oxidation peak current was observed with ZMCPE when compared to the bare carbon paste electrode (BCPE). The anodic oxidation peak current (I_{pa}) Vs scan rate (ν) was linear with a correlation co-efficient of 0.9939 which indicates that it is a diffusion controlled reaction. The concentration of UA ranges from 0.01μM to 0.2mM with a correlation coefficient of 0.9975 and the detection limit was found to be 5.1×10⁻⁷M. The detection limit of UA and DA were 0.01μM and 0.04 μM with correlation coefficients of 0.97028 and 0.97103 respectively. This modified electrode showed an excellent sensitivity, selectivity, stability, fast response and reliability for the voltammetric determination of DA in the presence of UA and the same was satisfactorily used for the determination of UA in human serum and urine samples.

KEYWORDS: Uric Acid (UA), Dopamine (DA), Zirconia (ZrO₂), Cyclic Voltammetry (CV) and Differential Pulse Voltammetry (DPV)