

ELECTROCHEMICAL CHARACTERIZATION OF SCREEN-PRINTED CARBON ELECTRODE MODIFIED WITH GRAPHENE AND TYROSINASE FOR DIRECT DETERMINATION OF PARACETAMOL

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Abstract

The aim of this study was to develop an amperometric biosensor utilizing mushroom (*Agaricus bisporus*) tyrosinase (EC 1.14.18.1) suitable for the selective determination of acetaminophen in human urine. The presented biological device was based on a commercial screen-printed carbon electrode covered with a thin graphene layer (transducer) with an enzyme (bioreceptor) immobilized with glutaraldehyde and Nafion. Owing to the use of tyrosinase and presence of NFG, the developed analytical instrument is able to measure even at potentials of 0 V. Linear ranges differ according to choice of detection potential, namely up to 130 $\mu\text{mol L}^{-1}$ at 0 V, up to 90 $\mu\text{mol L}^{-1}$ at -0.1 V, and up to 70 $\mu\text{mol L}^{-1}$ at -0.15 V. The first mentioned linear range is described by the equation $I_p [\mu\text{A}] = 0.236 - 0.1984c [\mu\text{mol L}^{-1}]$ and correlation coefficient $r = 0.9987$. The limit of detection of APAP was estimated to be 1.1 $\mu\text{mol L}^{-1}$. A recovery of 96.8% ($c = 25 \mu\text{mol L}^{-1}$, $n = 5$ measurements) was calculated. Best flow rate in flow injection analysis was 0.6 $\text{mL}\cdot\text{min}^{-1}$. It can be stated that this biosensor can be used to detect paracetamol in very complex samples such as urine, for the possibility of operation at potential 0V.

References

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Figures

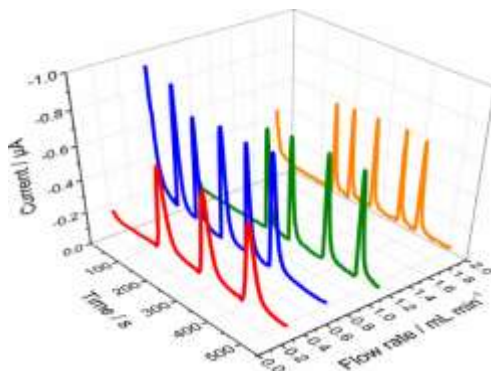


Figure 1. Effect of flow rate



Figure 2. Preparation process of Tyrosinase biosensor

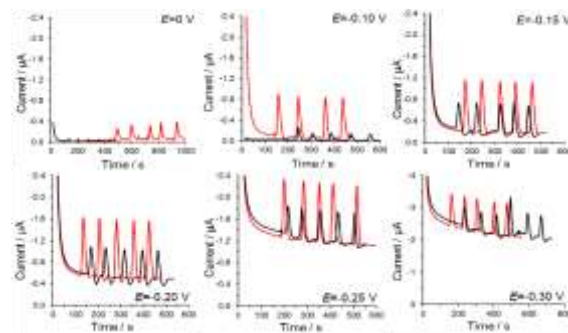


Figure 3. Dependence of the amperometric response of pure human urine (blue) and that with an admixture of $50 \mu\text{mol L}^{-1}$ APAP (yellow column). Supporting electrolyte: non deaerated 0.1 mol L^{-1} PBS of pH 7.0; injection volume: $100 \mu\text{L}$, flow rate: 0.6 mL min^{-1} and temperature: 25°C .