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DETERMINATION OF CATECHOL IN NATURAL WATERS WITH A BIOSENSOR BASED ON TYROSINASE IMMOBILIZED WITHIN POLY-3,4-ETHYLENEDIOXYTHIOPHENE FILM

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Abstract: Some phenolic compounds with low molecular mass are toxic pollutants. They have a potential hazard especially for aquatic life, they often enter the aquatic environments via industrial residues from different categories of production, such as dyes, drugs, plastics, resins, pesticides etc. The most important source of contamination is the paper and cellulose industry. Among phenolic compounds, the catechol is very important in the human health because it could react with protein and cause blood coagulation. Therefore, it is significant to improve detection of catechol to protect human health. The use of biosensors for the detection and quantification of catechol has advantages, such as fast response, short time of analysis, simplicity of fabrication, and high selectivityand sensitivity. Additionally, sample treatment is not required.

In this work, a biosensor using a screen printed carbon electrode (SPCE) modified with tyrosinasewithin a poly-3,4-ethylenedioxythiophene(PEDOT) film is developed. PEDOT layer was electrosynthetized in the presence of sodium sulphate as doping agent. Glutaraldehyde crosslinking agent was used as for tyrosinase immobilization. The developed biosensor was characterized by scanning electron microscopy (SEM), electrochemical impedance spectroscopy (EIS) and cyclicvoltammetry (CV) in the presence of catechol. After optimization of the experimental parameters, the determination of catechol was carried out by amperometry at fixed potential. The analytical performances characteristics of the biosensor were determined obtaining a linear concentration range from $2.0 \times 10^{-6}$to 12.0×10^{-5}mol·$L^{-1}$with a detection limitof 1.2×10^{-7}mol·L^{-1}. The proposed biosensor presented appropriate repeatability and stability for the practical applications. Furthermore, thisnew method based on amperometrywas successfully used in the determination of catechol in Danube watersamples. The results obtained with the biosensor were in agreement with a 99% confidence level for those achieved using the official spectrophotometric method.

Keywords: biosensor, catechol, natural water

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