

A Modified Carbon Paste Biosensor for Phenolic Compounds

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Abstract: An enzymatic carbon paste electrode for determination of phenolic compounds is developed. The electrode material was prepared by mixing the monodisperse graphite powder with paraffin and with crude mushroom tissue containing polyphenol oxidase (PPO) in its living environment. The ratio between electrode components such as carbon - tissue - paraffin was investigated using SCV (Stare Case Voltammetry) technique in 0.1 M sodium phosphate buffer solution, pH 7 and scan rate 50 mV/s. The derivative voltammograms are used to evaluate the biosensor response. The analytical performance was closely related to the carbon powder granulometry. The optimal results regarding the background current and sensitivity (1.57 mA/ppm) were obtained when carbon powder granules ranged between 0.09-0.071 mm. The activity of the PPO taken from four separated sections of the mushroom body was also studied. Kinetic of enzymatic reaction resulted according to the Michaels–Menten mechanism. The biosensor response was tested toward different phenolic compounds. The best signal regarding the sensitivity of the biosensor ($S = 2.04$ mA/ppm), the coefficient of correlation ($R^2 = 0.9997$) and detection limit (0.7 ppm) was obtained for hydroquinone whereas the other studied compounds were listed in this order: hydroquinone > catechol > phenol > m-cresol > 4-clorophenol > p-cresol > 4-nitrophenol > 3-nitrophenol.

Keywords: *Phenolic compound, carbon paste biosensor, PPO, crude tissue, Voltammetry*

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