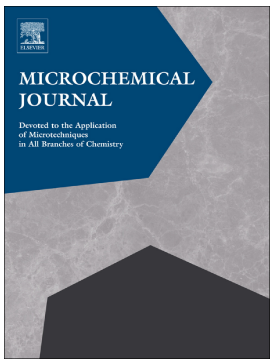

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Electrochemical biosensor based on ionic liquid polymeric microparticles. An analytical platform for catechol

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Abstract

A catechol amperometric biosensor based on tyrosinase has been successfully developed. Tyrosinase was immobilized into microparticles prepared by polymerization of the ionic liquid 1-vinyl-3-ethyl-imidazolium bromide (ViEtIm^{+}Br^{-}). Different kinds of microparticles with entrapped tyrosinase based on ionic liquid were obtained from the latter, by a simple anion-exchange reaction. The synthesis of the microparticles was optimized. The analytical method based on the proposed device was also optimized in terms of pH and temperature. Optimal values were 6.5 and 25 ºC, respectively. The characterization of both, microparticles and analytical device, was performed by cyclic voltammetry and electrochemical impedance spectroscopy. A linear relationship between the current signal and the catechol concentration was obtained in the range from $3.9 \cdot 10^{-5}$ to $2.5 \cdot 10^{-4}$ M, with a sensitivity of 17.95 mA M^{-1} cm^{-2} and a detection limit of 20 µM. The tyrosinase activity of lyophilized poly(ViEtIm^{+}Br−) microparticles was unchanged for at least 9 months after their synthesis. The biosensor maintains 95% of the initial response 21 days after its first use. The biosensor has been applied for detecting phenol compounds in wastewater samples. The recoveries were found in the range of 91-96%.

Keywords: polymeric microparticles, ionic liquid, electrochemical biosensor, tyrosinase, catechol, waste water