

Development of a Laccase Biosensor for Determination of Phenolic Micropollutants in Surface Waters

Eric de Souza Gil^{1*}, Stefani Garcia Rezende¹, Eli José Miranda Ribeiro Júnior², Hernane Toledo Barcelos³, Paulo Sérgio Scalize², Mariangela Fontes Santiago¹, Michelle Pereira Quintino¹, and Vernon Sydwill Somerset⁴

¹ Faculty of Pharmacy, Federal University of Goiás, Goiânia, Brazil.

² Faculty of Environmental Engineering, Federal University of Goiás, Goiânia, Brazil.

³ Department of Chemistry, University of Brasilia, Brasília, Brazil.

⁴ Natural Resources and the Environment (NRE), CSIR, Stellenbosch, 7600, South Africa.

Abstract

Laccase is a poliphenoloxidase enzyme that catalyzes the oxidation of phenolic compounds in the corresponding quinones. The current obtained in this redox process can be used for quantitative analysis. In this work, a carbon paste biosensor modified glutaraldehyde functionalized silica and an enzymatic extract of the *Pycnoporus sanguineus* fungi as a laccase source is proposed for phenol determination. The effect of carbon paste and electrolyte composition, pH from 3.0 to 8.0, start potential from 0.55 to 0.25 mV, scan rate from 5 to 25 mV s⁻¹ and potential pulse amplitude from 10 to 60 mV on the differential pulse voltammetric response was investigated. A linear correlation of $r^2 = 0.9946$ was obtained for the phenol content (catechol) in the concentration range from 50 to 500 nmol L⁻¹, with a detection limit of 30 nmol L⁻¹. This biosensor was used for the determination of different kinds of phenolic compounds, presenting a better response for catechol.