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STATISTICAL EVALUATION AND PROCESS OPTIMIZATION OF BIOTREATMENT OF POLYCYCLIC AROMATIC HYDROCARBONS IN A BIOREACTOR

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Abstract

Application of a biological treatment system using white rot fungi is an interesting alternative for treatment of water and wastewater contaminated with persistent organic pollutants, such as polycyclic aromatic hydrocarbons (PAHs). A packed bed bioreactor using the white rot fungi, *Phanerochaete chrysosporium* (*P. chrysosporium*) was evaluated for degradation of pyrene and phenanthrene in polluted wastewater. White rot fungi have significant potential to metabolize organic pollutants such as PAHs by means of their ligninolytic enzymes. This study examined the effect of feed flow rate (0.14 to 0.55 mL min⁻¹) and initial PAHs concentrations in feed (50 to 100 mg L⁻¹). Response surface methodology (RSM) was applied to predict the degradation of PAHs available in influent and enzyme activity. The RSM results showed that the best model for PAHs removal efficiency and enzyme activity is the reduced quadratic model. The optimum region, identified based on four critical responses, was an influent flow of 0.35 mL min⁻¹ and initial pyrene and phenanthrene concentrations of 60 mg L⁻¹. This resulted in 90% removal efficiency for pyrene and 87% for phenanthrene and enzyme activity of 57 U L⁻¹ for MnP and 426 U L⁻¹ for LiP.

Keywords: ligninolytic enzyme, packed bed bioreactor, *Phanerochaete chrysosporium*, polycyclic aromatic hydrocarbons, response surface methodology

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