

Application of the mixture design to decolourise effluent textile wastewater using continuous stirred bed reactor

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Abstract

Important pollutants in textile effluents are mainly recalcitrant organics, colours, toxicants and inhibitory compounds, surfactants, chlorinated compounds (AOX), pH and salts. An aerobic system using a continuous stirred bed reactor (SBR) was continuously operated at constant temperature and fed with textile wastewater (pH 7 and total chemical oxygen demand (COD) 1 700 mg/ℓ). This report is focused on the decolourisation treatment of effluent by a bacterial consortium (*Sphingomonas paucimobilis*, *Bacillus* sp. and filamentous bacteria). The influence of the different mixtures of 3 strains on the decolourisation of effluent (cell density fixed at OD₆₀₀ = 1) was studied using an equilateral triangle diagram and mixture experimental design to assess colour and COD removal during species evolution. With the aid of analysis software (Minitab 14.0), the formulation of pure culture was optimised for several responses and the best formulation obtained. The results suggested that the highest predictable specific decolourisation rate and chemical oxygen demand (COD) were 86.72% and 75.06%, respectively. Regression coefficients between the variables and the responses of decolourisation and COD removal were, respectively, $R^2 = 72.48\%$ and 54.28% , which indicated excellent evaluation of experimental data by the polynomial regression model. UV-visible analysis confirmed biodegradation of effluent.

Keywords: textile wastewater, bacterial decolourisation, response surface, mixture design, SBR