



Research article

Application of cloud point extraction coupled with derivative spectrophotometry to remove binary mixture of Cresol Red and Methyl Orange dyes from aqueous solutions: Box–behnken design optimization

Shahnaz Sargazi^{a,b}, Mohammad Taghi Ghaneian^a, Mashaallah Rahmani^c,
Ali Asghar Ebrahimi^{a,*}

^a Environmental Sciences and Technology Research Center, Department of Environmental Health Engineering, School of Public Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

^b Health Promotion Research Center, Department of Environmental Health Engineering, School of Public Health, Zahedan University of Medical Sciences, Zahedan, Iran

^c Department of Chemistry, Faculty of Sciences, University of Sistan and Baluchestan, Zahedan, 98135-674, Iran

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ABSTRACT

Cloud point extraction (CPE) was employed to eliminate Cresol Red (CR) and Methyl Orange (MO), as anionic dyes in a binary mixture from aqueous solutions. To remove these dyes Triton X-100 and NaCl at pH 5.7 were utilized. In this vein, wavelengths of 365 nm and 520 nm were respectively selected for CR and MO using the derivative spectrophotometer and first-order derivatives. According to based on the first-order derivative spectrophotometry, the recoveries risen from 94.3 to 99.5 % for CR and from 94.6 to 99.1 % for MO. In the following, the response surface methodology was administered to investigate the effect of surfactant concentration, temperature, and time on the dyes' elimination process. The quadratic mathematical model was obtained from the Box-Behnken design (BBD) matrix and developed to estimate the impact of each variable and its relationship with the elimination parameters. Later, coefficients of determination (R^2) ≥ 0.97 were obtained using model equations and comparison between predicted and empirical values. Analysis of variance estimated the models' significance and anticipation while processing the study variables. Based on the results, the model of pseudo-first-order in kinetic modelling can best describe dyes adsorption among the studied models. The analyzed dyes adhere to the Langmuir model with correlation values of 0.86 for CR and 0.87 for MO. The monolayer capacity (Q_{max}) was determined as 0.77 mol/mol for CR and 26.41 mol/mol for MO.

1. Introduction

Water pollution, caused by improper municipal and industrial wastewater disposal, harmful contaminants, and poor solid waste management, has a detrimental effect on the health of all living beings. Due to the large volume of wastewater entering the water, uninterrupted effort is required to ensure proper wastewater disposal in the ecosystem [1,2]. Colored wastewater discharges from

* Corresponding author.

E-mail address: ebrahimi20007@gmail.com (A.A. Ebrahimi).

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