



Application of response surface methodology to optimize 4-nitrophenol adsorption by prepared molecular imprinting polymers

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ABSTRACT

4-Nitrophenol (4-NP) removal using prepared molecular imprinting polymers (MIPs) as a specific adsorbent was investigated. On the basis of single-factor experiment, Box–Behnken statistical experiment design (BBD) and response surface methodology (RSM) were used to investigate the influence of MIPs dosage, initial concentration of 4-NP, pH and temperature of the solution, and their potential interaction effect on 4-NP removal. The quadratic polynomial regression model of response value Y (4-NP removal efficiency) was established based on the BBD experimental results. The reasonable and reliable of regression of the model was confirmed by the analysis of variance test and residuals analysis ($R^2 = 0.9952$). The RSM model indicates that all single-factors had a significant effect on 4-NP removal. The interaction effect between MIPs dosage and temperature, temperature, and pH were not significant but the other four interaction effects were significant. The regression model showed an optimum removal of 79.63%, while 78.39% removal was obtained from batch experiments at the optimum conditions suggested by the regression model, which reconfirmed the validity of the model. The results demonstrated that prepared MIPs possessed a strong adsorption ability for 4-NP removal, allowing a possible practical application in future water treatment.

Keywords: 4-nitrophenol; Molecular imprinting; Adsorption; Response surface methodology

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