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Response surface methodological approach for optimizing heavy metal biosorption by the blue-green alga *Chroococcus disperses*

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ABSTRACT

In this study, the performance of live *Chroococcus dispersus* algae for the removal of As, Cd, Co, Cr, and Fe from aqueous solutions as batch was investigated. For this purpose, Box–Behnken design and response surface method were applied to evaluate and optimize the interactive effects of three operating variables including metal concentration, time of reaction, and algae dose on the bioaccumulation process. The regression equation coefficients were calculated, and the data confirmed the validity of second-order polynomial equation for the removal of As, Cd, Co, Cr, and Fe with *Chroococcus dispersus* algae. Analysis of variance showed a high coefficient of determination value (R^2) for As, Cd, Co, Cr, and Fe being, respectively, 0.996, 0.994, 0.996, 0.995, and 0.998. The optimum metal concentration, time of reaction, and algae dose were found to be, respectively, 5.03 mg L^{-1}, 114 h, and 2.96 g L^{-1} for As; 11.9 mg L^{-1}, 109 h, and 2.66 g L^{-1} for Cd; 11.5 mg L^{-1}, 102 h, and 2.87 g L^{-1} for Co; 7.75 mg L^{-1}, 105 h, and 2.51 g L^{-1} for Cr; and 10.4 mg L^{-1}, 118 h, and 2.73 g L^{-1} for Fe. Under optimal value of process parameters, maximum efficiencies for the removal of As, Cd, Co, Cr, and Fe were 96.7%, 97.12%, 98.55%, 95.82%, and 99.4%, respectively.

Keywords: Heavy metal removal; Optimization; Box–Behnken design; *Chroococcus dispersus* algae; Biosorption

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