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Investigation on biosorption of Cd (II) onto Gelidiella acerosa (brown algae): Optimization (using RSM & ANN) and mechanistic studies

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ABSTRACT

Cadmium biosorption capacity of the biosorbent prepared from *Gelidiella acerosa* (brown algae) from synthetic cadmium solutions at optimum process conditions was investigated. The surface functional groups of the biosorbent responsible for biosorption were identified using FTIR analysis and the surface texture and porosity of the biosorbent was analyzed by SEM analysis. Response surface methodology (RSM) and artificial neural network (ANN) combined with central composite design (CCD) were used for modeling and optimization of biosorption and to study interaction effects of the three effective process variables such as solution pH, initial cadmium ion concentration and biosorbent dosage. Prediction capacities of RSM and ANN were compared and found that RSM showed better prediction performance than ANN. Kinetic data were well fitted to second order rate equation showing maximum biosorption capacity of 21.73 mg/g for 100 mg/l metal solution concentration. It was further confirmed by fitting the data to Elovich model. Biosorption mechanism was investigated using Intra-particle diffusion and Boyd models. The optimum cadmium removal efficiency of the biosorbent was found as 90.25%.

Keywords: ANN; Biosorption; Cadmium; Gelidiella acerosa; Kinetics; RSM

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