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Optimization of lead (II) sorption potential using developed activated carbon from tamarind wood with chemical activation by zinc chloride

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ABSTRACT

An adsorbent prepared from tamarind wood with chemical activation by zinc chloride was used to study its sorption potential on removing lead (II). An efficient response surface methodology (RSM) is used for optimization of removal of lead (II) from aqua solutions. While the goal of adsorption of lead (II) optimization was to improve adsorption conditions in batch process, i.e. to minimize the adsorbent doses and to increase the initial concentrations of lead (II). A 2^4 full factorial central composite design experimental design was employed. Analysis of variance showed a high coefficient of determination value ($R^2 = 0.996$) and satisfactory prediction second-order regression model was derived. Maximum lead removal efficiency was predicted and experimentally validated. The optimum adsorbent dose, temperature, initial concentration of lead (II), and initial pH of the lead (II) solution were found to be 1.44 g L^{-1}, 50°C, 49.23 mg L^{-1}, and 4.07, respectively. Under optimal value of process parameters, high removal (>99%) was obtained for lead (II). The study clearly showed that RSM was one of the suitable methods to optimize the operating conditions and maximize the lead removal. Graphical response surface and contour plots were used to locate the optimum point.

Keywords: Adsorption; Activated carbon; Lead (II); Optimization; Tamarind wood; Wastewater treatment

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