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Modeling of arsenic removal from aqueous solution by means of MWCNT/alumina nanocomposite

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ABSTRACT

In this study, response surface methodology (RSM) was employed for investigating the removal of As(V) from aqueous solution using multiwalled carbon nanotube (MWCNT)/alumina nanocomposite. The synthesized nanocomposite was characterized by scanning electron microscopy and X-ray diffraction. For conducting the experiments, four independent variables of initial As(V) concentration ranging from 0.1 to 0.9 mg L^{-1}, pH 3–11, contact time ranging from 15 to 1,450 min and adsorbent dose 0.5–1.5 g L^{-1} were selected and consecutively coded as X_1, X_2, X_3, and X_4 at three levels (−1, 0, and 1). A second-order polynomial regression model was then applied to predict responses. Regression analysis showed good fit of the experimental data to the second-order polynomial model with R^2 value of 0.9409 indicates the high correlation between observed and predicted values. At the optimum conditions that were initial As(V) concentration 0.5 mg L^{-1}, pH 7, contact time 80 min, and adsorbent dose 1 g L^{-1}, the As(V) removal efficiency was about 99.4%. This study proved that Box–Behnken design under RSM could efficiently be applied for modeling of As(V) removal by MWCNT/alumina nanocomposite.

Keywords: As(V) removal; Box–Behnken design; MWCNT/alumina nanocomposite

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