Comparative studies of linear and nonlinear methods of pseudo-second-order kinetic in Ni(II) removal from aqueous solution onto calcium alginate

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\textbf{ABSTRACT}

In this study, a comparison between linear and nonlinear methods of estimating the kinetic parameters of Nickel(II) removal onto calcium alginate was examined. The kinetic data were analyzed using the four different type of pseudo-second-order linear kinetic model. The coefficient of determination \( r^2 \) and chi-square test \( \chi^2 \) was employed as methods of error analysis for determining the best-fitting equation. The type 3 pseudo-second-order kinetic model accurately represented the kinetic uptake of Ni(II) by Ca-alginate. Further, the nonlinear method of pseudo-second-order was suitable in estimating biosorption parameters. In addition, the \( \chi^2 \) test was found to be a better method for determination of the best-fitting model. EDX analysis of Ca-alginate biosorbent before and after Ni(II) sorption revealed that the ion-exchange mechanism was the principal sorption process.

\textbf{Keywords:} Adsorption; Nickel(II); Calcium alginate; Kinetics; Regression analysis