



Modeling of phenol adsorption isotherm onto activated carbon by non-linear regression methods: models with three and four parameters

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ABSTRACT

The adsorption equilibrium isotherms of phenol from aqueous solutions onto powdered activated carbon were studied and modeled. The activated carbons CAH1 and CAH2 were obtained by carbonizing the activated rice husks at 500°C and 450°C, respectively, while CAMH was obtained by carbonizing a mixture of 12 g rice husk and 8 g coffee husk at 500°C. In order to determine the best fit isotherm, the experimental equilibrium data were analyzed using four adsorption isotherm models with three-parameters (Redlich–Paterson, Sips, Langmuir–Freundlich, Toth) and three adsorption isotherm models with four-parameter (Fritz–Schlunder, Baudu, Marczewski–Jaroniec) equations. Four error functions, coefficient of determination (R^2), chi-square error function (χ^2), residual root mean square error (RMSE) and HYBRID fractional error function were applied to determine the best fit isotherm. The error analysis showed that the models with three parameters better described the adsorption of phenol data compared with the four-parameter models. All the values of chi-square, HYBRID and RMSE obtained are small, except the Fritz–Schlunder isotherm onto CAH1, this indicate that the adsorption of phenol is favorable onto CAH1, CAH2 and CAMH.

Keywords: Adsorption; Error analysis; Isotherm; Non-linear regression

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