



Modeling of equilibrium and kinetics of chlorobenzene (CB) adsorption onto powdered activated carbon (PAC) for drinking water treatment

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ABSTRACT

A batch system was applied to study the adsorption equilibrium and kinetics of chlorobenzene (CB) from aqueous solution by powdered activated carbon (PAC). Adsorption isotherm was determined at 25°C and the experimental data obtained were mathematically modeled with the Langmuir, Freundlich, Langmuir–Freundlich and Toth equations. Non-linear regression and Chi-square (χ^2) analysis have been undertaken to determine the best isotherm and isotherm parameters. The Langmuir–Freundlich model yielded the best fit to the experimental data. The influence of two experimental parameters, initial CB concentration and PAC dose, on the adsorption kinetics was evaluated. The kinetics data obtained were modeled by pseudo-first-order, pseudo-second-order, and Langmuir–Freundlich kinetic models, respectively. The rate constants of Langmuir–Freundlich kinetic model obtained by extended geometric method are independent of initial CB concentration and PAC dose. The results show that the adsorption amount and relative removal of CB at any time for any initial CB concentration and any PAC dose can be estimated directly with the rate constants by using the Langmuir–Freundlich kinetic model.

Keywords: Chlorobenzene; Equilibrium isotherm; Kinetics; Adsorption; Powdered activated carbon (PAC); Water treatment

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