ADSORPTION OF PENTACHLOROPHENOL ONTO ACTIVATED CARBON IN A FIXED BED

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ABSTRACT

The adsorption of pentachlorophenol (PCP) from water onto granular activated carbon (GAC) was studied. Equilibrium and kinetic behaviour was studied, and the results used to predict fixed bed adsorber behaviour.

Batch equilibrium tests showed that the adsorption capacity of activated carbon for PCP is best represented by the Freundlich isotherm, with constants of K = 95 and 1/n = 0.18. Batch adsorption kinetics experiments were conducted in a spinning basket reactor. Surface diffusion and external film transfer coefficients were determined by fitting the homogeneous surface diffusion model (HSDM) to the experimental batch adsorption data. A surface diffusion coefficient value of 2.26×10^{-9} cm/s was calculated using this method, which was similar to surface diffusion coefficients for similar compounds found by other investigators.

Using equilibrium and kinetic parameters, the HSDM was used to predict bench scale fixed bed adsorber breakthrough curves at varying flow rates. A correlation was used to calculate the film transfer coefficient. There was a good agreement between the experimental breakthrough curves and those predicted by the model. By varying parameters in the model it was found that the adsorption rate in the PCP-activated carbon system was primarily limited by surface diffusion. The homogeneous surface diffusion model was shown to be effective in predicting breakthrough of PCP and could conceivably be used to predict full scale adsorber performance or to aid pilot plant studies.

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