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Application of activated carbon fibre (ACF) for lead removal in aqueous solution

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ABSTRACT

In this study, the adsorption of lead from aqueous solution by activated carbon fibre (ACF) was investigated. Several series of experiments were conducted to examine the effect of operating conditions such as the equilibrium time, the flow rate, and the initial concentration that are known to affect the adsorption rate. Average removal efficiency was almost 98% for the initial lead concentration of less than 10 mg/L. Breakthrough point in ACF unit reached at 4.5 h of operational time with the flow rate of 40 mL/min and initial lead concentration of 10 mg/L. Adsorption capacity of the filter was found to be 0.5 mg/mg of ACF. The removal efficiency has decreased by the factor of 0.53 after one hour of operating time. Among the several regression curves tested, three dimensional non-linear regressions gave over 90% of fitting while for other linear regression curves it was in the range of 60–70% depending upon the various operating parameters. Non-linear models described the relationships of permeate lead concentration (C) with initial concentration (C_0) and operation time (t), giving a good generalization of the kinetics of lead in ACF for the laboratory tested ranges.

Keywords: Activated carbon fibre; Adsorption; Lead; Regression curve; Aqueous solution

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