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Application of shrinking core model to the adsorption of oxytetracycline onto peanut hull-derived activated carbon in a closed-loop fixed-bed reactor

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ABSTRACT

In the present paper, the ability of peanut hull-derived activated carbon AC(PH-800) to adsorb oxytetracycline (OTC) was investigated using batch adsorption with fixed-bed reactor. The factors influencing adsorption, such as contact time and sorbent concentration, were evaluated. Sorption kinetic and equilibrium data of OTC sorption onto AC(PH-800) were submitted to kinetics and equilibrium models in order to calculate the adsorption constant rate and the maximum capacity of the sorbent. The application of shrinking core model (SCM) for the removal of OTC was investigated with two assumptions finite and infinite volume solution. Oxytetracycline adsorption increased for increasing initial OTC concentrations, and equilibrium isotherms can be accurately described by the Freundlich equation. Experimental data were analyzed using the SCM and the analysis based on statistical and graphical method proved that the adsorption followed the product layer diffusion controlled equation of the model. The approach modeling considering a finite volume solution assumption was more successful than the modeling approach involving an infinite volume solution.

Keywords: Oxytetracycline; Sorption mechanism; Activated carbon; Activation; Carbonization

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