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A simple method for the determination of adsorption kinetic parameters using circulating-type shallow bed reactor (CSBR)

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ABSTRACT

This study focuses on a novel technique for determining intraparticle diffusivity (D_p) and fluid-film mass transfer coefficient (k_F) using a recycling type fixed-bed reactor. The detail analysis technique is established in this study. The D_p and k_F values of phenol on XAD-2000 are 7.26–11.4 × 10^{-6} (cm^2 s^{-1}) and 0.0035–0.0062 × 10^{-3} (cm s^{-1}), respectively. The obtained D_p values are similar to the values obtained in the shallow bed reactor 1.6–2.7 × 10^{-6} (cm^2 s^{-1}). The method has significant advantages over the conventional shallow bed method in chemical/solution saving with easy operation. This technique is useful to estimate diffusivities of phenolic compounds onto resins, especially when the fluid-film mass transfer resistance cannot be negligible.

Keywords: Phenol; Recycling shallow bed reactor; Adsorption; Intraparticle diffusivity; Fluid film mass transfer coefficient

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