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Numerical simulation and parameter analysis of Acid Red B migration in river sand

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ABSTRACT

In this study, the adsorption and migration characteristics of Acid Red B (AR B) in river sand were investigated using batch and column experiments. The Freundlich equation was used to fit the experimental data of isothermal adsorption. The penetration curves of tracer Cl^- and AR B were simulated by HYDRUS-1D. The results show that with the increase of the initial pH value, the adsorption coefficient K_F in the Freundlich equation decreases gradually, and the adsorption ability of river sand to AR B is weakened. With the increase of initial pH in sand column outflow experimental, the peak value C/C_0 of AR B penetration curve is closer to 1, which indicates that the adsorption is weakened and easy to migrate at higher pH value. The simulation results of non-equilibrium one-site model fitting in HYDRUS-1D show the deterministic coefficient $R^2 > 0.872$ and the root mean square error RMSE < 0.064. The parameters of the model simulation are consistent with the results of the column experimental the breakthrough curves. This model can better describe the migration process of AR B in river sand. It is not conducive to adsorption at higher pH (the smaller K_D), and AR B is easier to migrate with water flow in river sand.

Keywords: Acid Red B; Adsorption; Migration; Breakthrough curve; HYDRUS-1D

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