

Phosphorus sorption with modified sediments from a malodorous river: kinetics, equilibrium, and thermodynamic studies

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ABSTRACT

Utilization of sediment resources and excessive phosphorus (P) in malodorous river caught the interest of numerous researchers. This study investigated P sorption with modified sediments from malodorous rivers through kinetics, equilibrium, and thermodynamic experiments. Results indicated that sorption rate followed the pseudo-second-order model ($R^2 > 0.93$), and when the temperature increased, the P removal efficiency of modified sediment samples increased (the highest value of 93.2%). Modified sediment materials, which are oxidation (PS-N), Na-doped (PS-Na), and oxidation-Na doped (PS-NNa), presented higher P sorption capacities than raw sediment due to changes in their surface structure. PS-NNa showed the highest sorption capacity (1.43 mg g^{-1}) in comparison other sediment materials. Data from isotherm experiments were well described by Langmuir isotherm model, and calculated thermodynamic parameters illustrated occurrence of spontaneous ($\Delta G < 0$), entropy-driven P sorption ($\Delta S > 0$) and endothermic reactions ($\Delta H > 0$).

Keywords: Phosphorus; Malodorous river; Modified sediment; Sorption; Removal

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