Kinetics, Equilibrium and Thermodynamics of the Adsorption of Triphenyltin onto NanoSiO₂/Fly Ash/Activated Carbon Composite

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Abstract : In the present study, the kinetics, equilibrium and thermodynamics of the adsorption of triphenyltin (TPT) from TPTcontaminated water onto nanoSiO2/fly ash/activated carbon composite was investigated in batch adsorption system. Equilibrium adsorption data were analyzed using Langmuir, Freundlich, Temkin and Dubinin-Radushkevich (D-R) isotherm models. Pseudo first- and second-order, Elovich and fractional power models were applied to test the kinetic data and in order to understand the mechanism of adsorption, thermodynamic parameters such as ΔG° , ΔSo and ΔH° were also calculated. The results showed a very good compliance with pseudo second-order equation while the Freundlich and D-R models fit the experiment data. Approximately 99.999 % TPT was removed from the initial concentration of 100 mg/L TPT at 80oC, contact time of 60 min, pH 8 and a stirring speed of 200 rpm. Thus, nanoSiO2/fly ash/activated carbon composite could be used as effective adsorbent for the removal of TPT from contaminated water and wastewater.

Keywords : isotherm, kinetics, nanoSiO₂/fly ash/activated carbon composite, tributyltin

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