ABSTRACT

Modified polyurethane (APU) was used as an absorbent for removal of aqueous ammonium. The surface structure of polyurethanes were modified by covalent bonding of carboxylic functional group of alginate. Effects of various operation parameters (such as temperature and pH) on adsorption capacities of APU for ammonium ion were investigated. Langmuir and Freundlich models were fitted on experimental data. It was found that Freundlich model described best for adsorption of ammonium ion onto APU. The values of Freundlich parameter $K_F$ was found to be 0.276, 0.367, and 0.406 (mg/mg)/(mg/L)$^{1/n}$ at temperature of 288, 298, and 308 K, respectively. Analysis of kinetic data showed that adsorption of ammonium ion follows pseudo-first-order kinetics. The value of first-order kinetic coefficient, $k_1$, was found to be $7.93 \times 10^{-3}$, $1.37 \times 10^{-2}$, $1.45 \times 10^{-2}$ h$^{-1}$ at 288, 298, and 308 K, respectively. The values of standard free energies at different temperatures were within $-22.76$ to $-26.81$ kJ/mol with higher value at higher applied temperature. The value of standard enthalpy was found to be $-0.40$ kJ/mol. The optimum pH for ammonium ion adsorption onto APU was found within pH range 5–7. Results reveal that application of APU can be beneficial for removal of aqueous ammonium; hence, it can improve the quality of water.

Keywords: Alginate-modified polyurethane; Ammonium ion; Adsorption; Wastewater reuse