

Application of adsorption models for fluoride, nitrate, and sulfate ion removal by amx membrane

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Abstrak

An anion exchange membrane, (AMX) that carries a quaternary ammonium functional group has been investigated for its adsorption of fluoride, nitrate and sulfate from aqueous solutions. Fitting of the Freundlich, Langmuir, and Dubinin–Radushkevich adsorption models to the equilibrium data was performed at different temperatures in the range of 283–313K. The sorption parameters of the studied models were determined by linear regression and discussed. Adsorption analysis results obtained at various temperatures showed that the adsorption pattern on the membrane followed Langmuir isotherms. Thermodynamic studies revealed that the adsorption of the AMX membrane to the studied ions was spontaneous. The ΔG^0 values suggested the affinity order of the membrane for the studied anions. At 283K and 298K, the affinity order was: $\text{SO}_4^{2-} > \text{NO}_3^- > \text{F}^-$. This order was: $\text{NO}_3^- > \text{SO}_4^{2-} > \text{F}^-$ at 313K. The standard enthalpy change and the standard entropy change were found to be -11.63 kJ/mol and -9.93 J/mol. K for the adsorption of nitrate, -7.42 kJ/mol and -58.73 J/mol. K for the adsorption of sulfate, and -74.21 kJ/mol and -274.9 J/mol. K for the adsorption of fluoride, respectively. The negative values of standard free energy ΔG^0 indicate the spontaneous natures of adsorption of studied anions onto the AMX membrane.