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Aminated chitosan-g-poly(butyl acrylate) copolymer for heavy oil spills removal: kinetic, isotherm, and thermodynamic investigations

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ABSTRACT

The kinetic, isotherm, and thermodynamic investigations of the heavy oil spills removal by aminated chitosan-g-poly(butyl acrylate) copolymer have been carried in this study. The kinetic studies of the heavy oil spills removal by both adsorption and absorption processes were carried out using different models namely; pseudo-first-order, pseudo-second-order, and Elovich models. The oil diffusion control process studied by both intraparticle diffusion and Boyd diffusion models. The isotherm of the removal process under equilibrium conditions was investigated by Langmuir, Freundlich isotherm, and Temkin models. Furthermore, the thermodynamic of the process has been also depicted. The obtained results indicated the removal process followed the pseudo-first-order and pseudo-second-order in a very good way and followed both the Langmuir and Freundlich isotherm. The maximum monolayer sorption capacity was found as 41.49, 84.0, and 100.0 g/g for aminated chitosan, aminated chitosan-g-poly(butyl acrylate) 10, and aminated chitosan-g-poly(butyl acrylate) 20, respectively. The thermodynamic studies revealed that sorption was spontaneous and endothermic in nature.

Keywords: Aminated chitosan; Grafting; Kinetics; Isotherm; Thermodynamics

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