



Removal of methylene blue dye using biodegradable hydrogel and reusing in a secondary adsorption process

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ABSTRACT

Sodium alginate poly itaconic acid (NaAlg/IA) hydrogel was prepared by free radical polymerization using gamma radiation. Characterization of the hydrogel was done by thermogravimetric and Infrared analysis. The hydrogel was used for removal of methylene blue dye (MB) about 85% of dye was removed. The experimental data have been modeled by Langmuir, Freundlich, and Temkin, the adsorption data were well described by the Freundlich model. The adsorption kinetic was studied and the pseudo-second-order reaction was better than pseudo-first-order reaction for low concentrations of MB and vice versa. The calculated dimensionless separation factor R_L was 0.1 indicates favorable adsorption process. Thermodynamic parameters suggest that the adsorption is physical process ($\Delta H^\circ = -17.87$ kJ/mol), spontaneous, and exothermic in nature. After adsorption, the NaAlg/IA hydrogel-loaded MB was applied to secondary adsorption of acid fast red dye (AFR) at suitable conditions. Successful results were obtained about 74% of AFR was removed due to the altered surface structures of the used adsorbents.

Keyword: Alginate; Itaconic acid; Hydrogel; Secondary adsorption; Waste dyes

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