

عنوان مقاله:

Textile effluent treatment using Avocado seeds based activated carbon

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خلاصه مقاله:

Textile industries consume a lot of water through their various textile production processes. Increased demand for textile products, ultimately increases the formation of wastewater, which labels the textile industry a main source of severe pollution problems worldwide. The agricultural wastes used for adsorbing pollutants were revealed to be efficient and economical adsorbents with high potential for removing dyes from polluted water. In this study, the synthetic textile effluent was simulated using Orange ۲ sodium salt (OSS) dye mixed with tap water. The treatment of OSS dye solution by adsorption process was conducted in a batch reactor employing the avocado seeds activated carbon (ASAC). The impacts of temperature, adsorption contact time, OSS dye initial concentration, ASAC biosorbent dosage, and OSS solution pH on the adsorption efficiency were explored and optimized by the Box Behnken design (BBD) of Response surface methodology (RSM). The optimum conditions for the dye removal were: temperature 40°C , adsorbent dosage 0.1g and initial dye concentration 10 mg/L . The yield of the OSS dye removal resulted to 96.5% . The OSS dye adsorption has best fitted with the Freundlich isotherm of adsorption ($R^2 = 0.9922$), suggesting the occurrence of a multilayer adsorption on the non-homogeneous surfaces of the ASAC. The kinetic study fitted with the kinetic model of Pseudo-second order. Also, the dye adsorption thermodynamics manifested that the adsorption of OSS dye was feasible and spontaneous with negative Gibbs free energy changes ($-\Delta G_0$) such as -2.18KJ/mol at 303K , -3.18KJ/mol at 308K , -3.58KJ/mol at 313K and -7.32KJ/mol at 323K . The adsorption was endothermic with positive enthalpy change ($+24.73\text{KJ/mol}$). The entropy study resulted in 0.25KJ/molK , revealing the augmenting chaos at the interface of the sorbent and dye solution during adsorption process. The use of avocado seeds as biosorbent enables the valorization of this agro-waste and waste management alongside efficient textile effluent treatment.

کلمات کلیدی:

Textile effluent, Avocado seeds activated carbon, Orange ۲ sodium salt dye, Optimization, Response Surface Methodology

