P54

DECOLORIZATION OF AQUEOUS EFFLUENTS USING AGRO WASTE

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Abstract

In this study, the potential of agro–waste for a food dye sequestration from aqueous effluents was investigated. Initially, four local agro-waste namely pumpkin seed hull, bean null, oat straw and nut shells, were tested in natural condition. Bean hull (*BH*) revealed the best uptake capacity for Food Red 14 (*FR14*). The agro waste was characterised before and after dye sorption process using *SEM* and *FTIR* techniques. Those analyses were conducted in order to identify the principal connections contributing to the sorption process.

The point of zero charge of BH surface, pH_{pzc} was assessed at 4.6, which indicated a mostly acidic surface, favorable for dye adsorption at pH<6, when the sorbent is positively charged. The dye removal efficiency of the adsorbent has been established in relation to some factors, such as: pH, amount of adsorbent, dye initial concentration, contact time and temperature. In order to make the sorption process predictable, four empirical isotherms and four kinetics models were applied to the experimental data so as to enact the nature of the sorption process. Attempts have also been made for sorbent viability by testing different solvents for *FR14* desorption.

FTIR spectra reveal the main bands in *FR14* sorption process: that at 1450 cm^{-1} corresponding to C=C bond from the aromatic ring appears greatly diminished for *FR14*-BH after the sorption process and suggests a horizontal orientation of the molecules. The movement of the band at 3442 cm^{-1}, corresponding to -OH groups, to lower wave number suggests lower involvement of these groups in the sorption process. The others band movement from BH spectra after the sorption process is due to physical interactions (hydrogen bond, van der Waals force) that occur between functional groups of sorbent and dye.

The present study shows that the agro-waste bean hull is very effective as biosorbent for Food Red 14 removal from aqueous solutions, from a large range of dye concentration in aqueous solutions (5-400 mg L^{-1}) in batch system. Since the agricultural wastes used in this study are friendly, abundantly and locally available, the sorbents are economically viable for aqueous effluents decolorization.