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NOTE

Adsorption of Malachite Green on to Combination of Chitin, Activated Charcoal and Alumina

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Adsorption of malachite green, an acid dye used for silk dying, on to combination of chitin, activated charocal and alumina has been found to depend on contact time, concentration, temperature and pH. The experimental data has been correlated with Langmuir's adsorption isotherm.

Untreated textile effluents are very toxic[1], as higher concentrations of dyes in them can cause water borne diseases[2] and increases biological oxygen demand (BOD), and chemical oxygen demand (COD) of receiving water. Complex structures and molecule size of these dyes renders them non-oxidisable by conventional biological and physical treatment methods[3]. Mubarakpur town of Azamgarh district of U.P. have cluster of textile units manufacturing Varanasi silk fabrics and these small industries are discharging untreated effluents containing quite high concentrations of acid disperse dyes in to river Tons. The existing treatment systems are too costly to be used by these units. Moreover, prevalent treatment processes are not able to completely decolourise the dye-house effluents. The present work has been planned to achieve success in this area by treating the effluents with adsorbents system containing a mixture of chitin[4], activated charcoal and alumina (adsorbent cell). The contents were shaken at a definite rpm, temperature and pH. The concentration of dye remaining in liquid phase after the adsorption was evaluated using Spectronic-20 spectrophotometer.

Capacity of the present adsorption system has been ascertained by studying the intraparticle diffusion/distribution process between the dye molecule and particles of adsorbent cell using adsorption isotherms, including Langmuir equation (1):

$$\frac{Ce}{q} = \frac{1}{Qo.b} + \frac{Ce}{Qo} \qquad (1)$$

The adsorption capacity, given by Qo has been found to be 22.727 mg/g and b representing energy of adsorption for the present system has been calculated as 0.2587.

The value of dimensionless separation factor evaluated by:

$$R_l = \frac{1}{1 + b.Co} \quad (2)$$

is 0.0189 (value less than 1 indicates favourable adsorption[5]). The possibility that dye malachite green is adsorbed to the adsorbent particles through intraparticle diffusion has been explored by plotting the amount of dye adsorbed against $(t)^{1/2}$ for different amount of dye adsorbed. The linear plot thus resulted manifested the average value of intraparticle diffusion rate constant K_p (0.8272 mg/g $min^{0.5}$). A linear plot of $\log_{10} (C_{max} - Ct)$ Vs t using Lagergren's equation (3):

$$\log_{10} (C_{max} - Ct) = \log C_{max} = \frac{K_{ad}}{2.303} t \quad (3)$$

has been obtained indicating first order nature of the process and adsorption rate constant, K_{ad}, evaluated from the curve is 8.248 min^{-1}

Studies relating to the effect of pH and temperature on the kinetics of adsorption of the dye on the present adsorbent system is in progress.

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