Short Communication

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DECOLORIZATION OF DYE WASTE WATER USING WASTE MATERIAL OF SUGAR CANE INDUSTRY

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ABSTRACT

Water pollution due to release of industrial wastewater has already become a serious problem in almost every Industry using dyes to color their products as well as for the survival of lives. Normally wastewater is treated in plants to remove undesirable components which include both organic and inorganic matters, and soluble and insoluble materials. This paper presents the color removal of textile waste water containing dyes using waste material of sugar cane industry. This is easily available in our country and is economical than the adsorbents of other processes used for the treatment of waste-water. The parameters of the experiments include initial concentration of dye, adsorbent amount and adsorption time.

INTRODUCTION

The effluent of textile wastewater contains a large quantity of dye that is inert and may be toxic at the concentration discharged into receiving water. The discharge of highly colored effluents into natural water bodies is not only aesthetically displeasing, but also impedes light penetration, thus upsetting biological processes within a stream. In addition, many dyes are toxic to some organisms causing direct destruction of aquatic communities. Some dyes can cause allergic dermatitis, skin irritation, cancer and mutation in human beings.

Although some existing technology may have certain advantages in the removal of dyes, their initial and operational costs are so high, that they constitute an inhibition to dyeing and finishing industries. On the other hand low cost technology does not allow a wishful color removal or have certain disadvantages. Hence, this paper suggests a low cost method using the waste material as an adsorbent giving good result.

Treatment of wastewater containing dyes by adsorption is an emerging field of research. The process of adsorption has an edge over other methods due to its sludge free clean operation and complete removal of dyes even from the dilute solutions. The commonly used adsorbent is activated carbon. However commercially available activated carbons are very expensive. Therefore there is a need to produce low cost and effective activated carbon that can be applied to control water pollution problem. The investigation reported here deal with the adsorption studies by activated carbon derived from H_3PO_4 impregnated baggasse for the removal of basic dyes from their aqueous solution.

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The choice of basic dye for the detailed investigation was based on large utilization in the textile industries. Methylene blue is the common basic dye used for dyeing. Experiments were conducted using the parameters such as initial concentration of dye, adsorbent amount and adsorption time. Color removal was measured using UV – VIS Spectrophotometer at wave length of 565nm.

MATERIALS AND METHODS

Baggase

Also called MEGASS is the fiber remaining after the extraction of sugar bearing juice from sugar cane . It is a waste material obtained after all the juice has been extracted from sugarcane The bagasse can be easily obtained from any sugar cane juice corner or sugar manufacturing industry at zero cost in abundant quantity.

Methylene Blue

Table 1. Physical and chemical properties of methylene blue

S. No.	Parameters	Values
1.	Color	Bright greenish blue
2.	Type of dye	Organic belongs phenothiazine family
3.	Chemical formula	$C_{16}H_{18}ClN_3S.2H_2O$
4.	Molecular weight	409.93
5.	Dye content	82%

Batch adsorption experiments were carried out using the stock solution having dye concentration 100mg/L of stock solution.

Phosphoric Acid

Table 2. Physical and chemical properties of phosphoric acid

S. No.	Parametrs	Values
1.	IUPAC Name	Orthophosphoric acid
2.	Chemical formula	H_3PO_4
3.	Molecular weight	99
4.	Melting Point	42.5 ^{0}C

Preparation of activated charcoal

Baggase was collected from local sugar mill. It was washed with hot distilled water to remove dust and dried in sunlight .The baggase was treated with 50 % phosphoric acid and burnt at 250oC in Muffle furnace for 5 and half hrs. After burning yield charcoal was washed with distilled water and dried in sunlight and packed for utilization.

EXPERIMENTS

1. Three subdivided samples of 50 mL each having concentrations of 20%,40% and 60% dye were prepared by using the stock solution in different conical flask.
2. These test samples were examined in UV – VIS Spectrophotometer to check the initial %Transmittance in order to measure the color of the solution.
3. 0.2gm of activated carbon from baggase was added in each conical flask .It was kept for 30 min. with periodic shaking .
4. After 30 min. the solution was filtered and final reading of %Transmittance was measured.
5. Same procedure was followed for 60 min., 90 min., 120 min. 150 min. and 180 min. to study the effect of adsorption time.
6. The procedure was repeated for varying the amount of absorbent i.e. 0.4g, 0.6 g and 0.8 g.

RESULTS AND DISCUSSION

1. Effect of adsorption time

To study the effect of adsorption time, the observations were plotted in to figure 1. This figure represents the % Transmittance increases with adsorption time for constant adsorbent amount of 0.2 g. It is observed that initial uptake of dye is quite fast, showing 87 % transmittance during the first 90 min. and obtain an equilibrium stage at 150 min. for the sample having 20 % Methylene Blue dye.

2. Effect of amount of adsorbent

Experiment was performed for four different amounts of adsorbent and it was observed that % Transmittance increases with increasing the amount of adsorbent for the same adsorption time for a constant dye composition.

For instance the solution of 20% composition gave 89% transmittance for 0.2 g of adsorbent and 95% transmittance for 0.8 g adsorbent, when observed for 150 min. adsorption time.

CONCLUSION

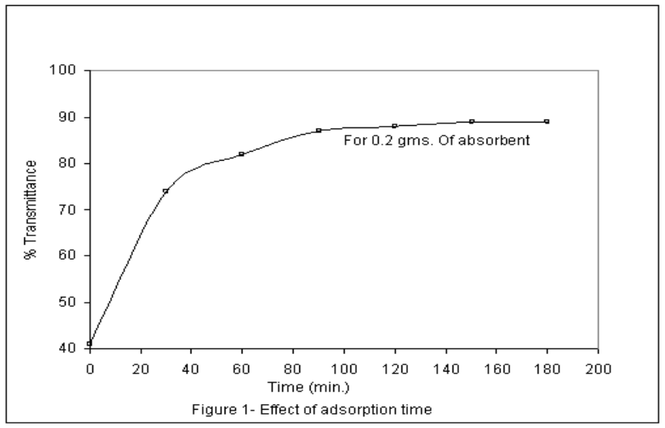

Figure 1- Effect of adsorption time

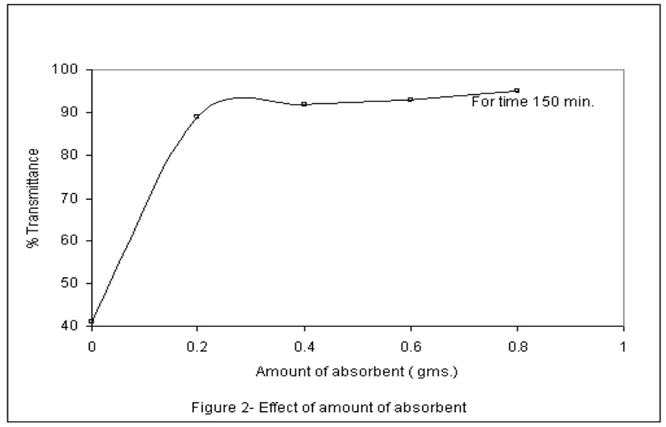

Figure 2- Effect of amount of absorbent

The following conclusion can be made from the present work :

1. For a given composition, the adsorption of dyes in activated charcoal of baggase increases with amount of adsorbent when operated for equal adsorption time.
2. With increase in adsorption time the adsorption of dye in activated charcoal of baggase increases while the other two parameters, i.e. amount of adsorbent and composition are same. Based on the results an showing Figure 3 the optimum condition are 0.8 g adsorbent, 150 min. adsorption time for 95 % Transmittance.

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