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Research Article

Study on Color Removal of Basic Dye by Potato Husk as an Adsorbent

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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 product. The study describes degradation ability of Potato husk powder on basic dye (Methylene blue). Experimental investigations have been made for color removal of textile waste water containing dye using batch adsorption technique and potato husk as an adsorbent . The effect of pH, temperature and amount of salt added in solution was investigated.

Keywords: Adsorption, Adsorbent, Methylene Blue, Color removal

INTRODUCTION

The effluent of textile wastewater contains a variety of quantities of dyes which are 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 it 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 may have certain disadvantages. Hence, this paper suggests a low cost method using the waste material as an adsorbent giving good result.

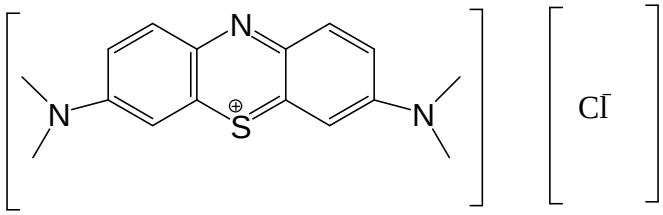
The choice of basic dye for the detailed investigation was based on large utilization in the textile industries. Methylene blue is the common basic dye used for dyeing. Experiments were conducted

using the parameters such as contact time, pH and temperature of solution. Color removal was measured using UV – VIS Spectrophotometer at wave length of 565nm.

MATERIAL AND METHOD

Potato Husk: The potatoes were purchased from nearby market of Raipur. Potatoes skin was removed and dried in shadow. It was then grinded to fine powder. All solutions of Methylene Blue (MB) were prepared in double distilled water and concentration of MB determined by UV-Spectrophotometer at λ_{MAX} = 565 nm. The adsorption experiments were carried out in stirred batch mode. For each set of experiment, 60 ml of MB dye solution of known concentration was continuously stirred with 0.2 gm of powder at 308K.

Methylene Blue: Methylene blue is a heterocyclic aromatic chemical compound with molecular formula: $C_{16}H_{18}N_3SCl$ and molecular weight 319.85 gm/mole. It has many uses in a range of different fields, such as biology and chemistry. At room temperature it appears as a solid, odorous, dark green powder, which yields a blue solution when dissolved in water.



IUPAC Name: 3, 7-bis (Dimethylamino) -phenothiazin-5-ium chloride

Structure of methylene blue.

Methylene Blue is a synthetic dye used in textile industry. Methylene blue is a commonly used stain that helps us see microscopic life in brilliant color and also for testing of DNA. Biologists often add a drop or two of Methylene blue to bacteria on a glass slide before placing the slide under the microscope. The blue color that stains the bacteria helps biologists see their shapes.

Method: For each batch experiment, 60 ml of dye solution of known concentration was continuously stirred with 0.2 gm of potato husk powder at 308K. Sample were withdrawn at particular time interval and filtered. Concentrations of filtered solution were obtained by UV-Spectrophotometer. The parameters of the experiments include contact time, temperature and pH of solution.

Result and Discussion

Effect of Contact time: It is observed that the removal efficiency of potatoes husk for dye increases in contact time and becomes constant after 50 min. Observations were taken up to 60 min.

Effect of pH of solution: The percentage transmittance of dye solution at various pH was studied in the range of 2-9. The solution was equilibrated for 60 min. The adsorption increases with increases in pH, from **Fig. 1**. The low adsorption in acidic range is due to the fact that surface becomes positivity charged, thus making (H+) ions compete effectively with dye cations causing decrease in adsorption. The same result has been observed by other investigators [2, 4]also.

Effect of temperature: The effect of temperature on removal of dye was investigated in the temperature range of 308-333k. From **Fig. 2,** it is observed that adsorption decreases with increase in temperature. The solubility of the adsorbent increase with increase in temperature, then effects work in the same direction, causing a decrease in adsorption [6].

Effect of added Nacl: From **Fig. 3,** it is observed that the amount of NaCl in the solution increases, the adsorption decrease, it may be due to competition of Na^+ with positive charged dye molecules for

the same binding sites on the adsorbent surface. Additionally, ionic atmospherenmay be progressivle NaCl concentration and results in the reduction of MB sorption on the tested material [7].

CONCLUSION

Potato husk used in this study are very suitable for color removal of wastewater contains dye. The following conclusion can be drawn from the present investigation:

1. The adsorption of MB to the adsorbent was found to be maximum at pH=9.
2. High removal dye at 333 K.
3. Removal capacity was increased dose of Salt.

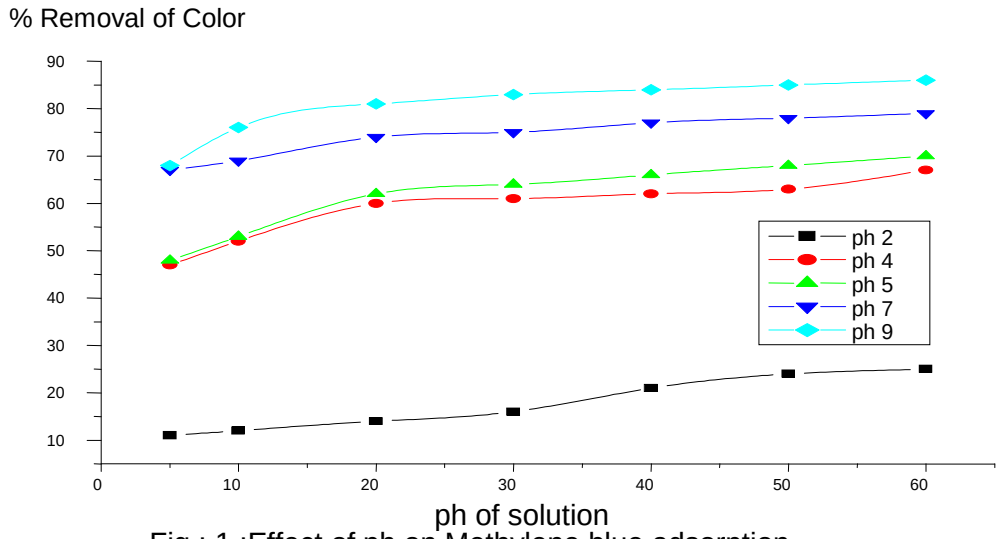


Fig.: 1 :Effect of ph on Methylene blue adsorption

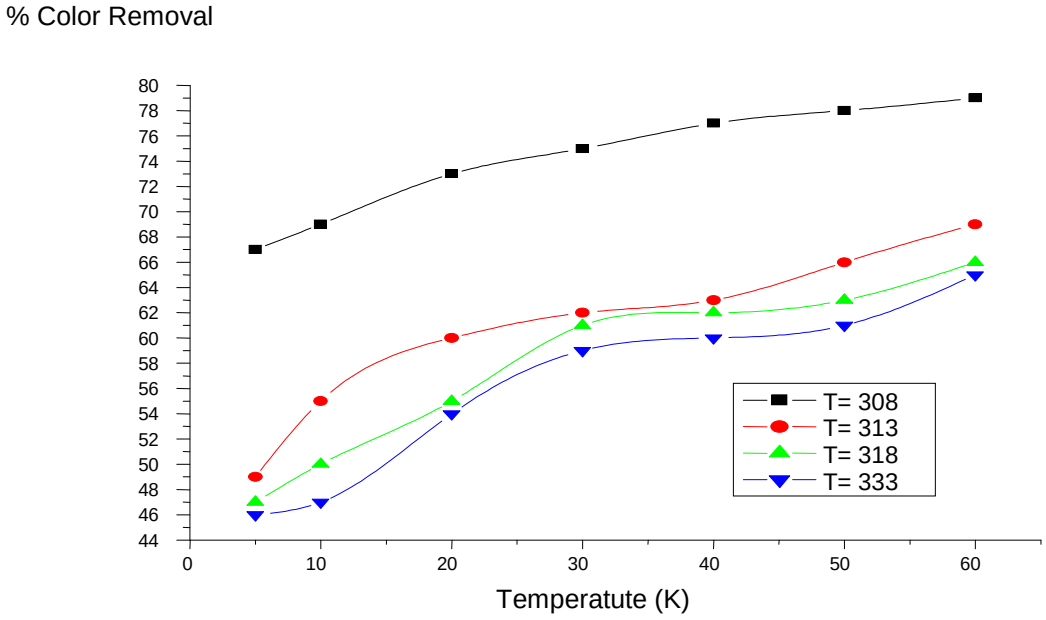


Fig.: 2: Effect of Temperatute on Methylene Blue adsorption

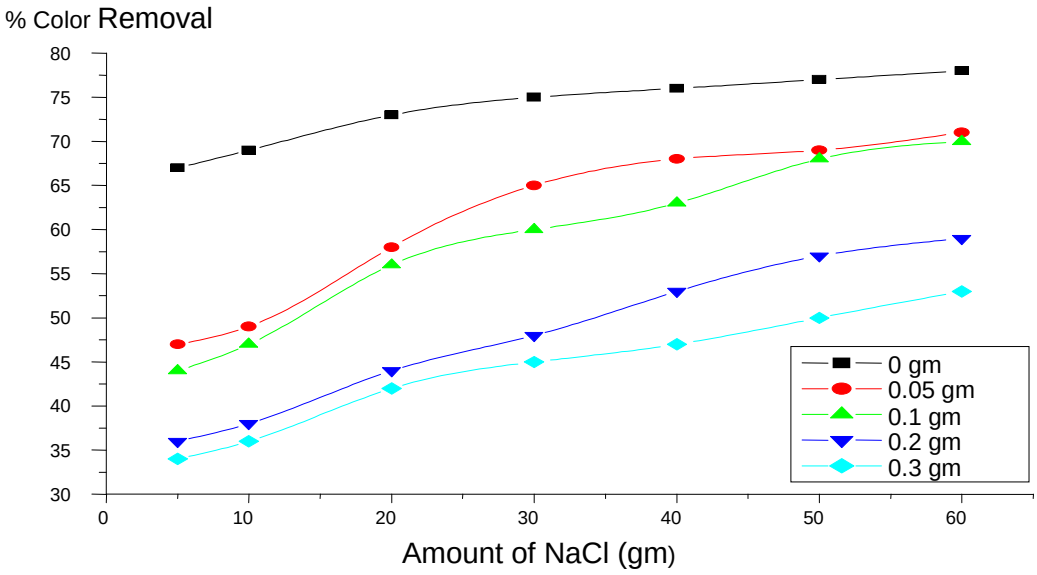


Fig.: 3: Effect of Added solt

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