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Adsorption Studies on Treatment of Textile Wastewater

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Abstract

Our present studies investigate the adsorption process in dying waste water using natural additives. Dying industry water is creating the harmful effect on the living organisms and also affects the ground water and natural water bodies. For natural additives used in adsorption process rice husk, rice straw, sugarcane bagasse, saw dust, activated bentonite clay, activated date seed, activated tea dust, activated cotton breed, neem leaf powder, and maize were used. The adsorbent doses were given 0.1 to 2.5g per 200 ml sample was used for the effective adsorption process. The dying waste water was collected from all win Tex, jay Vishnu textile units and balakumaran dying units in tirupur district. The waste water was highly alkaline, high in suspended solids and color. The above materials were employed to achieve maximum removal efficiency of color, turbidity, sulphate, chloride, iron, COD and BOD. The optimum adsorbent dosages were determined from the orbital shaker. The results shows that among various adsorption process and bacteriological process were very cost effective when compared to the chemical and other treatment process.

Keywords: *Textile Wastewater, Granular materials,*

INTRODUCTION

The wastes from small textile industries are directly disposed in water bodies, so the characteristics of the water changes and it can't be used for further purposes. It is harmful and affects the human health, it also affects the quality of the ground water used for irrigation purposes, and it is hazardous to the environment. So there is must need cost effective and easy methods for treatment. Adsorption is the most used method in physicochemical wastewater treatment, which can mix the wastewater and the porous material powder or granules, such as activated carbon and clay, or let the wastewater through its filter bed composed of granular materials. Through this method, pollutants in the wastewater are adsorbed and removed on the surface of the porous material or filter. Commonly used adsorbents are activated carbon, silicon polymers and kaolin. Different adsorbents have selective adsorption of dyes. But, so far, activated carbon is still the best adsorbent of dye wastewater. The Chroma can be removed 92.17% and COD can be reduced91.15% in series adsorption reactors, which meet the wastewater standard in the textile industry and can be reused as the washing water. Because activated carbon has selection to adsorb dyes, it can effectively remove the water-soluble dyes in wastewater, such as reactive dyes, basic dyes and azo dyes, but it can't adsorb the suspended solids and insoluble dyes. Moreover, the activated carbon cannot be directly used in the original textile dyeing wastewater treatment, while generally used in lower concentration of dye wastewater treatment or advanced treatment because of the high cost of regeneration. All the wastes from small textile industries are directly disposed in water bodies, so the characteristics of the water changes and it can't be used for further purposes. It is harmful and affects the human health, it also affects the quality of the ground water used for irrigation purposes, it is hazardous to the environment. So there is must need cost effective and easy methods for treatment.

MATERIALS AND METHODS

In this study the wastewater is collected from Balakumaran dying unit situated in Tirupur district which is a textile industry which has a daily wastage of 20,000 lit. The industry consumes about 20,000 lit as its intake and the whole water is becoming waste at the end of dying process. Natural adsorbents materials used in Neem leaf powder, Sugarcane bagasse, Rice husk, Rice straw, Tea dust, Cotton weed, Saw dust, Maize, Activated date seed carbon.

Fig-1: Neem leaf

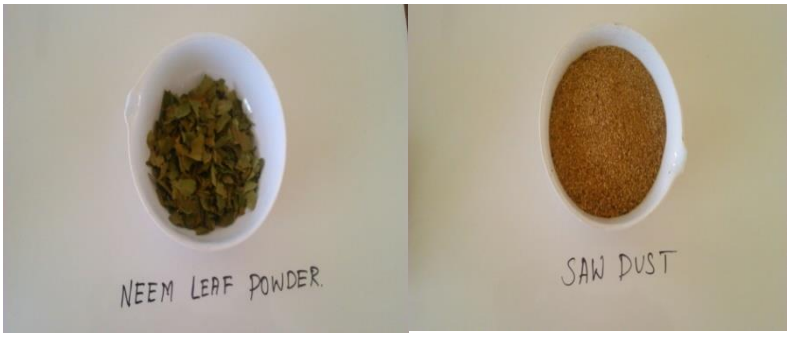
Fig -2: Rice husk

Fig 3:- Saw dust

Fig -4: Tea dust

Preparation on adsorbents

All the adsorbents were collected, cleaned and cut into small pieces. It was washed repeatedly by using distilled water to remove moisture and soluble impurities. These kinds of admixtures are dried for 12 days. Then those adsorbents were washed by 1N HNO3 and initially air dried. The final adsorbent is stored in airtight containers before adding to wastewater.



RESULT AND DISCUSSION

Effect of neem leaf powder as an adsorbent

Table 1: Effect on neem leaf powder as an adsorbent

Parameters /dosage	Initial parameters	0.5g	1g	1.5g	2.0g	2.5g
P^H	6.96	6.25	6.18	5.93	6.37	6.22
Turbidity (NTU)	13	4.6	3.2	2.8	2.6	2.6

The above table 1 shows that the treatment efficiency of low cost adsorbent prepared from neem leaves. From the experimental finding it has been observed that neem leaf can be used as an effective adsorbent material which can be used successfully for removal of colour.

The maximum colour removal efficiency was observed up to 70% for prepared neem leaves. It was found that colour removal efficiency was achieved maximum a very low dose of 12.5g/l with retention time of 18 hours.

Effect of sugarcane bagasse as an adsorbent

The below table 2 shows that the treatment efficiency of low cost adsorbent prepared from sugarcane bagasse from the experimental finding it has been observed that sugarcane bagasse can be used as an effective adsorbent material which can be used successfully for removal of colour. The maximum colour removal efficiency was observed up to 88% for prepared sugarcane bagasse. It was found that colour removal efficiency was achieved maximum a very low dose of 12.5 g/l with retention time of 24 hours.

Table 2: Effect of sugarcane bagasse as an adsorbent

Parameters /dosage	Initial parameters	0.5g	1g	1.5g	2.0g	2.5g
PH	6.96	4.5	4.3	3.9	3.8	3.5

Turbidity (NTU)	13	21.1	8	2.8	0.5	10.5

Effect of activated tea dust as an adsorbent

Table 3: Effect of activated tea dust as an adsorbent

Parameters /dosage	Initial parameters	2g	3g	4g
P^H	6.96	7.39	7.3	7.2
Turbidity (NTU)	13	4.7	4.2	4

The above table 3 shows that the treatment efficiency of low cost adsorbent prepared from activated tea dust. From the experimental finding it has been observed that activated tea dust can be used as an effective adsorbent material which can be used successfully for removal of colour. The maximum colour removal efficiency was observed up to 90% for prepared activated tea dust. It was found that colour removal efficiency was achieved maximum a very low dose of 10 g/l with retention time of 24 hours.

Effect of saw dust as an adsorbent

The below table 4 shows that the treatment efficiency of low cost adsorbent prepared from saw dust. From the experimental finding it has been observed that saw dust can be used as an effective adsorbent material which can be used successfully for removal of colour. The maximum colour removal efficiency was observed up to 70% for prepared saw dust. It was found that colour removal efficiency was achieved maximum a very low dose of 12.5g/l with retention time of 24 hours.

CONCLUSION

Our present investigations clearly suggest the available and low cost materials like neem leaf powder, sugarcane bagasse, Rice husk, Rice straw, activated Tea dust, Cotton weed, Saw dust, Maize, Activated date seed carbon, can be effectively used as a adsorbent materials. In maximum 80% of turbidity content removed by using adsorption process. The removal efficiency of adsorbents is affected by parameters investigated such as contact time, pH, adsorbent dosage, heavy metal concentration and competition with other

heavy metals. The adsorption increases with pH and adsorbent dosage. It is also proved that when locally available materials are used for wastewater treatment their requirement will increase which will provide livelihood for local farmers.

Table 4: Effect of saw dust as an adsorbent

Parameters /dosage	Initial parameters	0.5g	1g	1.5g	2g	2.5g
P^H	6.96	3.34	3.45	3.76	4	4.84
Turbidity (NTU)	13	10.5	10	10.9	9.8	8.1

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