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TREATMENT OF TEXTILE DYEING INDUSTRY EFFLUENT USING ACTIVATED CARBON

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ABSTRACT

Methods for treating textile dye wastewaters consist of various chemical, physical and biological processes. Among many decolourisation procedures the adsorption technique gives good results because it can be used for the removal of various types of colored matter. Commercial systems use mostly activated carbon as the sorbent for decolourisation of wastewaters because of its excellent adsorption ability. Although activated carbon has an advantage as a sorbent, its massive employment is restricted due to its high price. To reduce the treatment costs, cheap alternative adsorbents are being sought. In this study activated carbon is used to treat two different textile dyeing industry effluents and studied the effect of parameters like adsorbent dosage, RPM, pH and time.

Key words: Adsorption, Dye effluent, Dosage, RPM, pH, Time.

INTRODUCTION

Many types of dyes represent acute problems to ecological system as they considered toxic and have carcinogenic properties, which make the water inhibitory to aquatic life[1]. Due to their chemical structure, dyes possess a high potential to the resist fading on exposure to light and water[2]. The main sources of water generated by the textile industry originate from the washing and bleaching of natural fibers and from the dyeing and finishing steps[3]. Given the great variety of fibers dyes and process aids, these processes generate wastewater of great mechanical complexity and diversity, which are not adequately treated in conventional waste water treatment plant[4].

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EXPERIMENTAL

Materials and methods

Experimental procedure[5-8]

Test dye solution of 100 mg/L was prepared from effluent solution and this solution is taken in the reagent bottles, varying doses of adsorbents were added to study feasibility of color removal and the pH of the test mixture was adjusted when required. Then the reagent bottles containing test mixture was placed in an orbital shaker to facilitate effective mixing and precipitates formation. Then the reagent bottles were kept under undisturbed for 1 hr for settlement of precipitation formed. The settled precipitate is separated from the mixture by filtration. The filtrate is analyzed for % colour removal using the calibration curve. The effect of parameters like time, speed, dosage and pH are studied.

RESULTS AND DISCUSSION

Treatment of effluent-1: Effect of RPM on % color removal

Variation of color removal with RPM for effluent-1 (green colored dye) is given in Fig. 1. Maximum color removal of 30.89% occurs at an optimum RPM of 90.

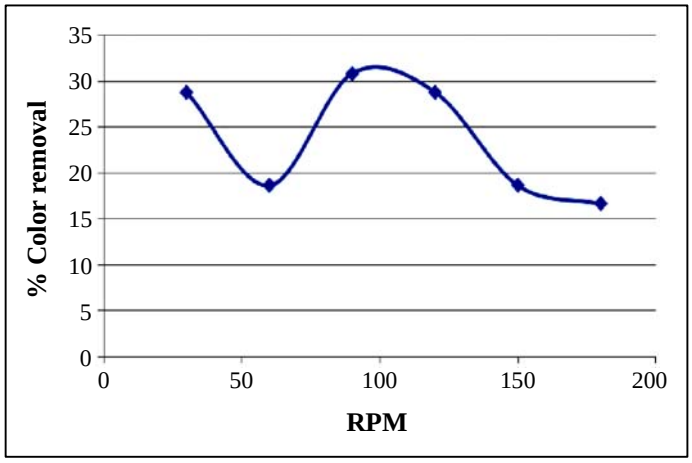

Fig. 1: RPM vs. % color removal

Effect of time on % color removal

Variation of color removal with time at optimum RPM of 90 for effluent-1 is given in Fig. 2. Maximum color removal of 59.34% occurs at optimum time of 120 min.

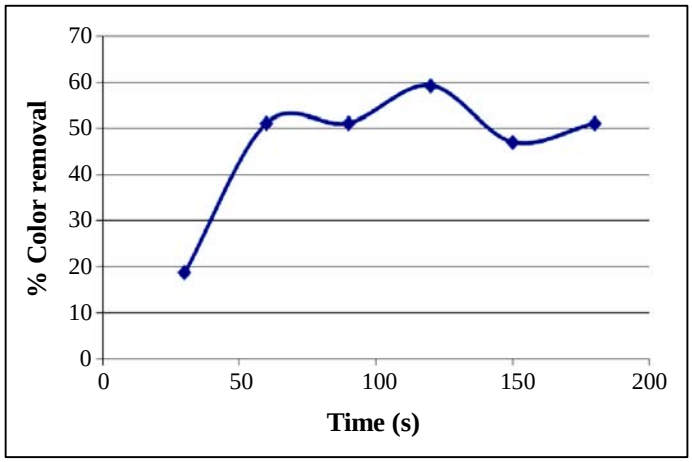

Fig. 2: Time vs. % color removal

Effect of dosage

Variation of color removal with dosage at optimum RPM of 90 and optimum time of 120 min for effluent-1 is given in Fig. 3. Maximum color removal of 69.51% occurs at optimum dosage of 2.0 g.

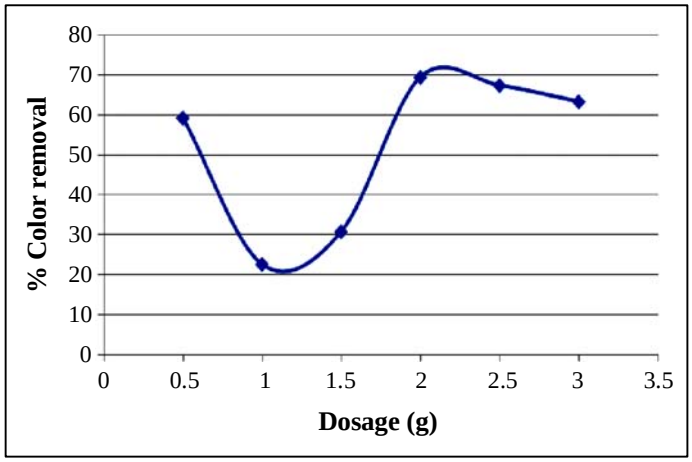

Fig. 3: Dosage vs. % color removal

Effect of pH on % color removal

Variation of color removal with pH at optimum RPM of 90, optimum time of 120 min and at optimum dosage of 2 g for effluent-1 is given in Fig. 4. Maximum color removal of 87.47% occurs at optimum pH of 2.55.

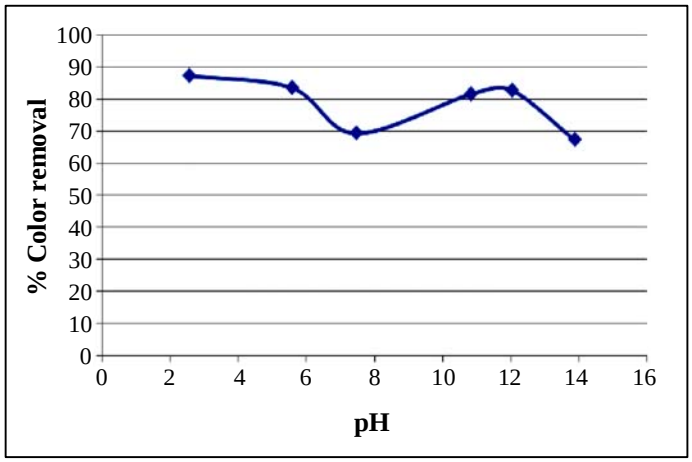

Fig. 4: pH vs. % color removal

Treatment of effluent-2

Effect of RPM on % color removal

Variation of color removal with RPM for effluent-2 (blue colored dye) is given in Fig. 5. Maximum color removal of 42.12% occurs at optimum RPM of 90.

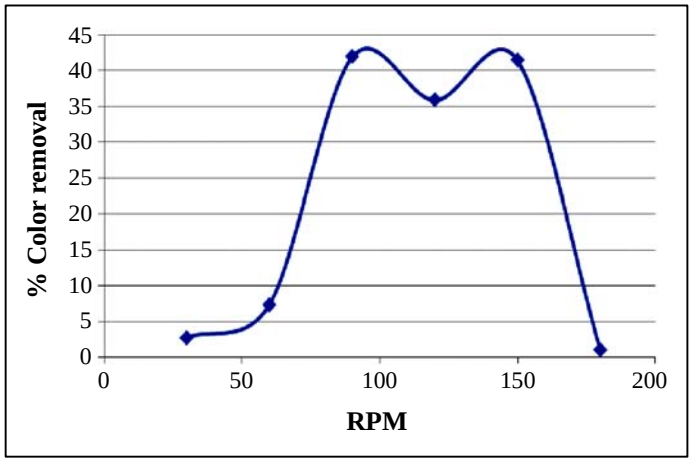

Fig. 5: RPM vs. % color removal

Effect of time on % color removal

Variation of color removal with time at optimum RPM of 90 for effluent-2 is given in Fig. 6. Maximum color removal of 59.25% occurs at optimum time of 90 min.

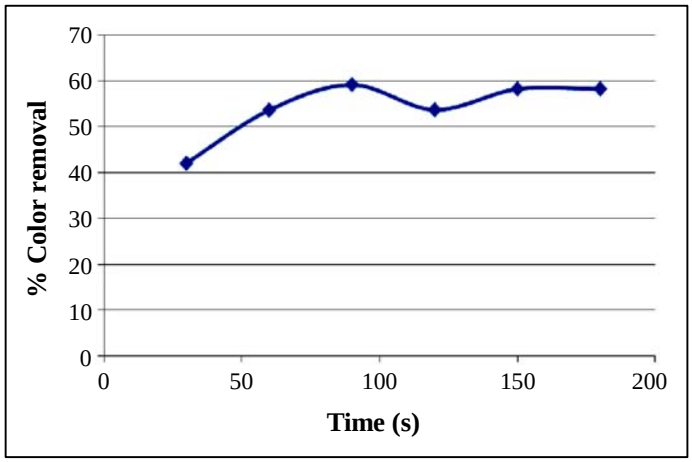

Fig. 6: Time vs. % color removal

Effect of dosage on % color removal

Variation of color removal with dosage at optimum RPM of 90 and optimum time of 90 min for effluent-2 is given in Fig. 7. Maximum color removal of 62.96% occurs at optimum dosage of 2.0 g.

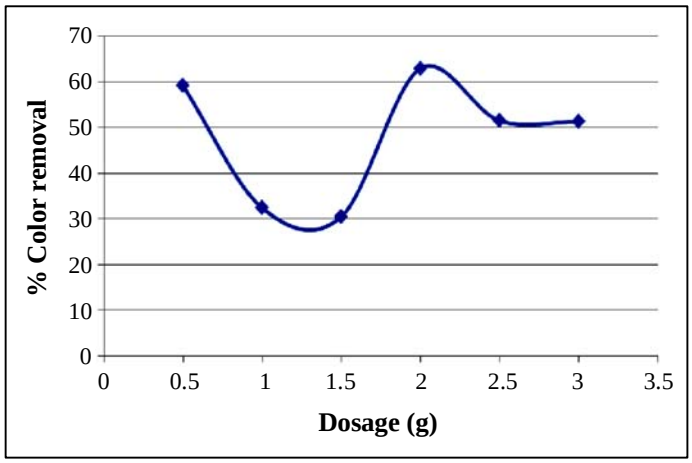

Fig. 7: Dosage vs. % color removal

Effect of pH on % color removal

Variation of color removal with pH at optimum RPM of 90, optimum time of 90 min and at optimum dosage of 2.0 g for effluent-2 is given in Fig. 8. Maximum color removal of 64.81% occurs at optimum pH of 4.56.

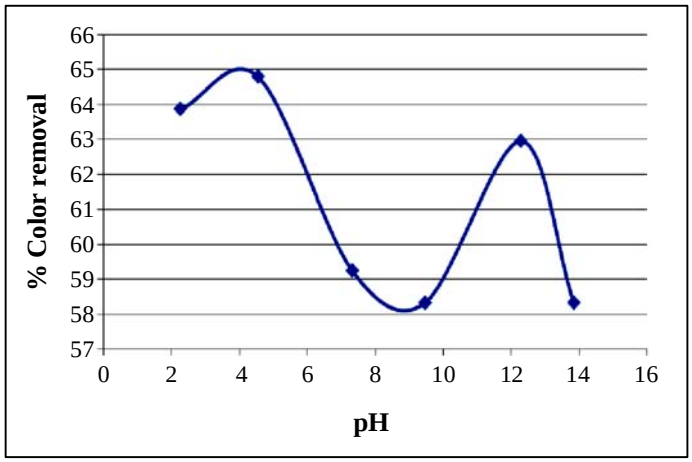

Fig. 8: pH vs. % color removal

CONCLUSION

Maximum percentage of color removal for each of the textile dyeing industry effluent and optimum values of variables is given in the following Table 1.

Table 1

Effluent	Optimum values of variables				Maximum color removal (%)
	RPM	Time (min)	Dosage (g)	pH	
1	90	120	2	2.55	87.47
2	90	90	2	4.56	64.81

From the above studies, it is concluded that dye effluents are amenable for their color removal and show positive response for treatment by the process of adsorption.

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