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COD REDUCTION STUDY OF TEXTILE WASTE WATER BY USING POLYELECTROLYTE AND ALUM

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ABSTRACT
The present research paper discusses fast yet simple method of treating textile effluent by coagulation-flocculation method. Composite effluent sample is analyzed for evaluation of treatment method. COD reduction of textile effluents were studied by using polyelectrolyte and alum. Settling characteristics of flocs formed in the coagulation process were studied at laboratory scale. The optimal dose volume of polyelectrolyte and alum were determined and its COD reduction efficiency was compared. Results showed that, optimum dosage for polyelectrolyte was found 10ml and 95.18% of COD reduction was achieved at contact time 48 hours whereas for alum optimum dosage was 30 ml and 77% COD reduction was achieved at contact time 48 hours.

KEY WORDS: Alum, COD, Coagulation, Dosages, Effluent, polyelectrolyte.

INTRODUCTION

Waste water is the major environmental issue of the textile industry among the other manufacturing industry,which are horrendous sources of environmental contamination (Balusubramania et al (2006), Daniel et al (2009), Banat et al (1996), Ghoreishi and Haghighi (2003). Textile water pollutants are basically responsible for increases it's COD, BOD, TDS, solids content and toxicity [Nemerow (1978), Aysun Ergene (2009), Karitikeyan and Alexander (2008)]. Thus this waste water must be treated prior to discharge in order to comply with the environmental protection laws for the receiving waters. There are different methods are available such as biological, chemical and physical to treat textile waste water. From these biological method is used for removal of BOD and suspended solids but they are ineffective for removal of dye from textile waste water, because such effluent have slow biodegradation rate. Adsorption is another widely used method for removal of dye from textile waste water [(Nagda and Ghole (2011), Vimonses (2009), Yadav et al (2011)].The coagulation and flocculation process is a versatile method used in order to remove suspended solids and organic matter as well as providing high colour removal in textile industry waste water [Akbal and Camc (2010),Meric et al (2011)].In the present study polyelectrolyte and alum were used for COD reduction of textile wastewater. The purpose of this proposed work is to investigate the COD reduction efficiency of given coagulant. The effect of parameters such as contact time and coagulant dosage were estimated on COD reduction of textile effluent.

MATERIALS AND METHODS

To study the textile effluent, composite effluent samples were collected from different sampling sites in an around east region of Solapur city, Maharashtra, India. From each sampling site, sample was collected in polythene bottles at one hour interval of time at working period of textile industry finally it was mixed and these sample was used for given analysis. COD analysis of given textile effluent before analysis was done. All the experiments were conducted using jar testing method to determine optimum dosages.

Preparation of Solution

1% solution of polyelectrolyte and alum were prepared and used for COD reduction study.

Step-I: Determination of optimum dosage: To determine the optimum dosage of polyelectrolyte and alum, the amount of polyelectrolyte were varied from 4ml to 12 ml and alum were varied from 5ml to 40 ml, the nature of flocculation was observed carefully. High turbid floccus was formed at specific amount of alum and polyelectrolytes were considered as the optimum dosage. Again this was confirmed by COD reduction at this optimum dosage.

Step-II: COD analysis of textile effluent at different interval of time

A 500 ml dye effluent was taken in two different jar (Each Jar contains 500 ml effluent) and different doses of polyelectrolyte and alum solution (1%) were added. The samples were stirred slowly. The whole contents were then settled for two hours. At the end of two hours, the supernant was withdrawn, filtered and filtrate was used for COD analysis. Again content were stay for different interval of time i.e. 5 hours, 12 hours, 24 hours, 48 hours etc. The supernant was withdrawn filtered at the different interval of time and used for COD analysis. The COD reduction was studied at this different retention of time at different doses of polyelectrolyte and alum.

RESULTS AND DISCUSSION

The effect of polyelectrolyte dosage

To study the effect of polyelectrolyte dosage on COD reduction of textile effluent, the dosages varied from 2ml to 12ml. Firstly the nature of flocculation was observed carefully with the help of this optimum dosages required for COD

reduction was determined. The natures of flocculation at different dosages with 500 ml textile effluent sample(in jar) are shown in table 1.

Table 1. Nature of flocs formation for different dosage of polyelectrolyte.

Dosage of polyelectrolyte	Nature of flocs
2 ml	No flocculation only turbidity is appeared
4ml	Slightly visible flocs are observed
6 ml	Slightly visible flocs with little settlement
10 ml	Highly turbid flocs with little settlement
12 ml	No further turbidity is observed

Thus optimum dosage of polyelectrolyte is 10ml. This can also confirm by studying the effect of dosages on COD reduction. The results obtained are shown in figure 1. The result showed that the COD reduction goes on increasing with increase in dosages of polyelectrolyte. But after 10ml dosage there is no further COD reduction. Thus an optimum dosage for polyelectrolyte is 10ml.

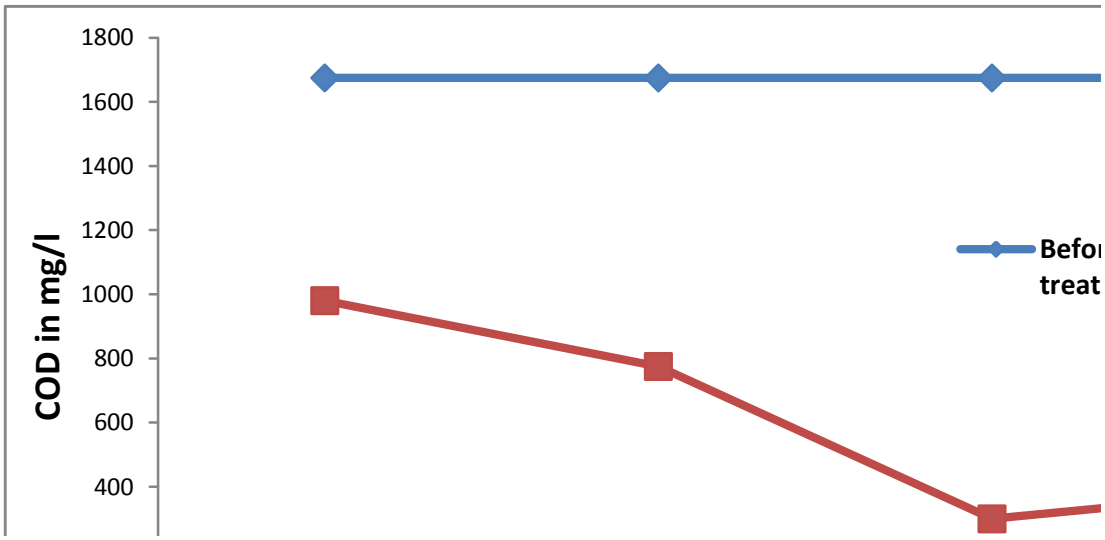

Figure 1. Effect of polyelectrolyte dosages on COD reduction

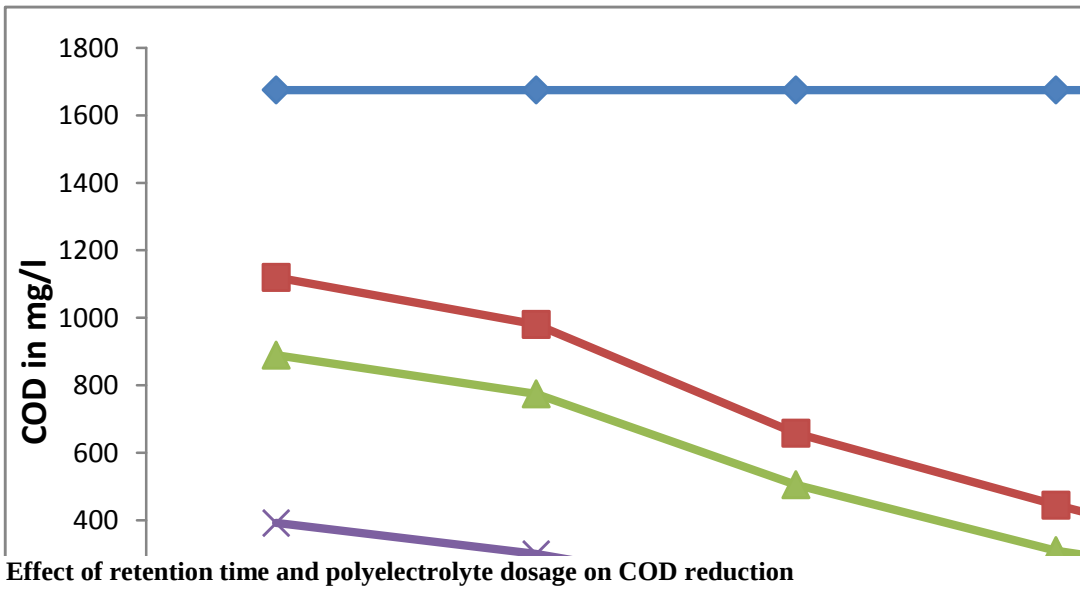

Figure 2. Effect of retention time and polyelectrolyte dosage on COD reduction

Effect of contact time on COD reduction by polyelectrolyte

The effect of contact time on COD reduction at 10ml optimum dosages are examined over different contact times i.e. starting from 2 hours to 48 hours. The result obtained is shown in figure 2. From result it is evident that COD reduction goes on increasing with increase in contact time. The 95.18% of COD reduction was achieved at contact time 48 hours for 10 ml optimum dosage of polyelectrolyte.

The effect of alum dosages

The amount of alum required to form flocs is important parameter which significantly affect the COD reduction or COD removal from waste water [Narayan and Goel (2011), Prabaharan and Rao (2003)]. The effect of dosages of alum ranging from 5ml to 30ml and COD reduction was investigated in 500ml textile waste water sample.

Nature of flocs was observed similar to polyelectrolyte and optimum dosage was calculated. In case of alum 30 ml of 1% alum solution was required for formation of turbid flocs and its settlement. Thus optimum dosage is 30 ml; this was again confirmed by COD reduction study at various dosages of alum. The effect of various dosages i.e. from 5ml to 30ml is shown in figure 3.showed that maximum COD reduction was achieved at 30ml optimum dosages further increase in dosage there is no reduction of COD.

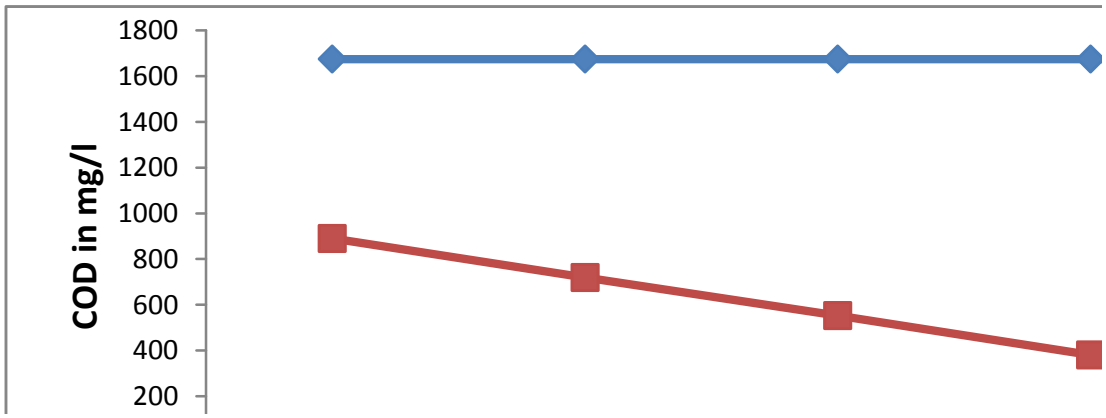

Figure 3. Effect of alum dosages on COD reduction

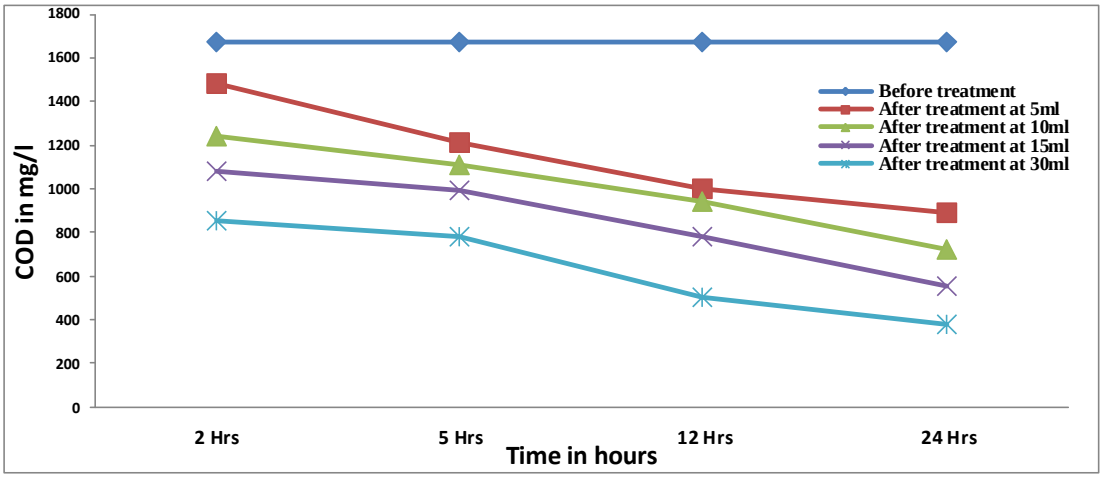

Figure 4. Effect of contact time and alum dosage on COD reduction

Effect of contact time on COD reduction by using alum

The effect of contact time on COD reduction by using optimum dosages of alum was studied, starting from 2 hours to 48 hours. The results are shown in figure 4. From results it is evident that as contact time increases the percentage of

COD reduction is also increases. The 77% COD reduction was achieved by using alum at optimum dosage 30ml at contact time 48 hours.

CONCLUSION

In case of polyelectrolyte percentage of COD removal increases from 76% to 95% within 48 hours at optimum dosages 10 ml, whereas for alum the percentage removal of COD was increased from 49.25 to 77% at optimum dosages 30 ml. Therefore from results it showed that polyelectrolyte was worked as efficient coagulant as compared to alum showing maximum COD reduction efficiency.

REFERENCES

Aysun E. (2009). Removal of Remazol Brilliant Blue-R from aqueous solution by adsorption onto immobilized Scenedesmusquadricauda. *Equ. Kin. Mod.. Stud.* **249**: 1308-1314.

Akbal F. and Camc S. (2010). Comparison of electrocoagulation and chemical coagulation for heavy metal removal. *Chem. Eng. Technol.* **33:**1655–1664.

Balusubramania I., Sabumon P. C., Lazar J. U. and Ilangovan R. (2006). Reuse of textile effluent treatment plant sludge in building material. *Wast. Management.* **6**: 22-28.

Banat I., Niyam P., Sing D., Marechant R. (1996). Microbial decolourization of textile dye containing effluents. *Rev. Biores. Technol.* **58**: 217-227.

Ghoreishi S.M. and Haghighi R. (2003). Chemical Catalytic Reaction and Biological oxidation for Treatment of non-biodegradable Textile Effluent. *J .Chem. Engg.* **95**:163-169.

Ikhu-Omoregbe D., Pardon K. K. and Edison M. (2009). Textile wet finishing operation. *Cong. Eng. G. Comp. Sci.* **1:**1-7.

Karitikeyan N. and Alexander J. J. (2008). Waste minimization in textile industry. *J. Ind. Text.* 35-49.

Meric S., Kaptan D. and Olmez T. (2004). Colour and COD removal from waste water containing reactive blank-5 using Fenton's oxidation Process, *Chemosph.* **54**: 435-441.

Nagda G. and Vikram S. Ghole (2011). Removal of Janus Green dye from aqueous solution by phosphoric acid carbonized agro industrial waste. *Sci. Asia.* **37**: 38-42.

Nemerow N. (1978). Industrial water pollution, characteristics and Treatment, Addison Wesley, Reading, Massachusetts. 738.

Prabaharan M. and J. Venkata Rao J. (2003). Combined desizing, scouring and bleaching of cotton using ozone. *J. Ind. Fib. Text. Res.* **28**: 437-443.

Sumit N. and Goel S. (2011). Enhanced coagulation for turbidity and total organic carbon (TOC) Removal from River Kanswati water. *J. Environ. Sci. Engg.* **53(1)**: 39-44.

Vimonses V., Leis S., Jin B., Chow C.W.K. and Saint C. (2009). Kinetic study and equilibrium isotherm analysis of Congo red adsorption by clay materials. *J. Chem. Engg*. **148**: 354-364.

Yadav S., Tyagi D. K. and Yadav O. P. (2011). Equilibrium and kinetic studies on adsorption of Congo-red dye from aqueous solution onto rice husk carbon. *Nat. Environ. Pollut. Tech.* **10(4)**: 551-558.