International Journal of Scientific Research and Engineering Development-– Volume 3 Issues 1 Jan- Feb 2020

Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

REMOVAL OF SULPHATE FROM INDUSTRIAL WASTE WATER USING NATURAL ADSORBENT (CHITPOSAN)

S.Karthika [1], P.Vensheeba Delin [2]

[1] PG student , [2] PG student.

[1&2] Department of civil Engineering , National Engineering college, kovilpatti Tamilnadu, India.

[1] karthika.s.neccivil2013@gmail.com

[2]vensheeba321@gmail.com

Abstract:

Industrial waste water collected from the match industry near kovilpatti which is not under the condition of treatment before disposal so we were choosing the match industry waste water as a reference for our studies. The industrial waste water highly polluted it contains large amount of chemical substances and organic matters and solids even heavy metals are also present in it. For the determination of sulphate, we are choosing gravimetric method for the studies. Because its advantages it is suitable for the determination of adsorbate in the industrial wastewater .Adsorption process is chosen for the removal of sulphate in the studies and chitosan is a biodegradable and non toxic material which is used.

Initial and final concentrations are sulphate determined. From the batch studies, maximum removal efficiency is find out and initial and final characteristics are analysed. Then the optimum dosage of chitosan shows removal efficiency for the treatment process of industrial wastewater in the economical way. From the final characteristics of industrial wastewater , the result shows chemical characteristics of industrial wastewater get reduced due to the applying chitosan as an adsorbent. Then the condition of adsorption isotherm which is obtained

Keywords: Adsorption process, chitosan, sulphate and Industrial waste water..

I.Introduction

Industrial waste water is the waste which produced during the process of manufacturing any product those are involved in chemicals category. It may be in solid , semi- solid , liquids. It contains heavy metals, dissolved solids, suspended solids and oils.

A. Physical Characteristics : The major physical characteristics of industrial waste water having the list of following such as solid content, colour , odour and temperature. Total solids may be suspended solids, volatile solids and dissolved solids. The colour of waste water indicates the three colours which are light brown , medium grey and black. It purely based on the duration of decomposition of waste and its contents present in the water. The temperature of waste water normally varies from 13 to 14 $^{\circ}$ C.

B. Chemical Characteristics: The major components of chemical characteristics of waste water consist of organic chemicals , inorganic chemicals, volatile organic carbons (VOC). The inorganic and organic chemicals such as sulphates, PH , alkalinity , chlorides, nitrates, free ammonia. The concentration measurement range of 10^{-12} to 10^{-3} mg/L.

The volatile organic carbon (VOC) like benzene , toluene , xylenes , trichloro ethane, methane and ethylene are the best examples of VOC.

II. **LITERATURE REVIEW** : **Bennie styen et al (2015**) makes a detailed study about the purification of water from the pollutants. Chitosan and polyacrylamide co polymer had been used

for this study under the adsorption process with sodium sulphate. To observe the optimal adsorption conditions required for the sulphate removal under the 3g/L at pH level of 4.

Mohammed Sadeq salmen et al (2014) investigated about activated carbon was produced from coconut shell and used for removing sulphate from industrial waste water in batch process. Under the conditions of pH , agitation time and adsorbent dose the percentage of removal of sulphate at 22 to 38 % at the level of pH 7.

Chinnaiya namasivayam et al (2016) makes a report about the study of coconut coir pith and Hexa trimethyl ammonium bromide used as an absorbent for the removal of sulphate from aqueous solution at the optimum pH 2.0.

Vikrant sarin et al (2014) studied about the several low cost biomaterials such as baggase, charred rice husk, activated charcoal and eucalyptus bark were tested for removal of chromium. among the adsorbents eucalyptus bark gave the better results of adsorption capacity 45mg / L in the concentration of 250 mg / L stack solution. the wastewater were obtained from metal finishing section of auto ancillaryunit.

.

III. NEED FOR THE STUDY

The past studies are shows about the removal of sulphate ions from industrial wastewater using chitosan and activated carbon were used as an adsorbent. Under the conditions of certain pH levels , dosage of adsorbent and agitation time. From this practical study, the industrial wastewater treated by using natural adsorbent (chitosan). Due to its versatile properties like biodegradability , biocompatibility , non- toxic and nature of polymer . the major objective of this study , to remove the sulphate from the industrial waste water through the natural adsorbent and made an onsite treatment for the wastewater.

IV. RESEARCH METHODOLOGY

The methodology is followed in this study , to remove the sulphate ions from the industrial waste water. Initially stock solution has been prepared and batch studies conducted under the conditions of optimum dosage , pH, contact time. Similarly batch studies also done for the industrial wastewater. The chemical characteristics of the industrial wastewater also tested. Finally the chitosan removal efficiency compared through the initial and final characteristics of industrial waste water.

V. RESULTAND DISCUSSION

a) EFFECT OF OPTIMUM DOSAGE

The significant way to determinethe optomium dodage in order to minimize the dosing cost and also to obtained the optimum performance in treatment . the optimum dosage of chitosan is 1.5mg/L. It produce 64.3% of sulphate removal.

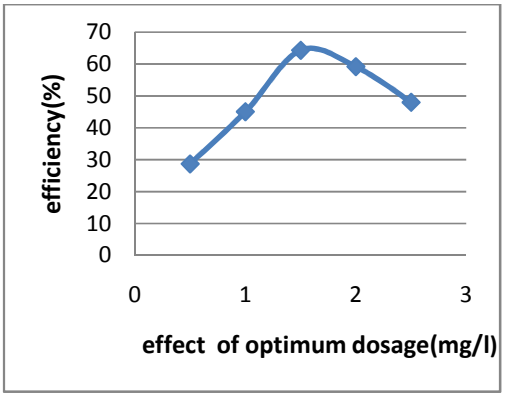

Fig no.1

b) EFFECT OF pH

The effect of pH was conducted by adjusting the pH from 4 to 8 and using the optimum dosage of chitosan 1.5 mg/L with 30 mins of mixing time . The optimum pH of industrial waste water is 6 , it produces high sulphate removal comparing to other pH. Thesulphate reductions for chitosan adsorption and different pH.

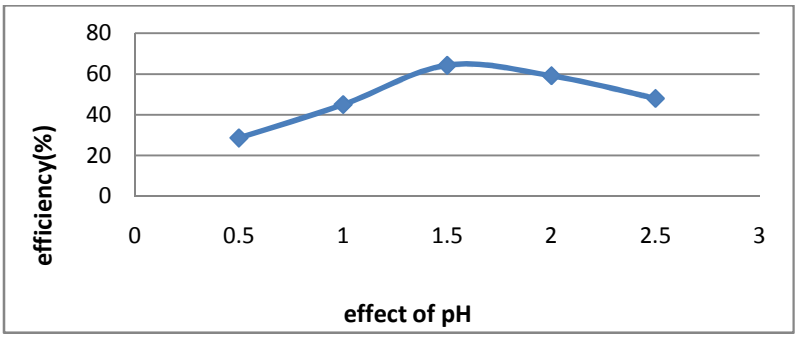

Fig no.2

c) EFFECTOF CONTACT TIME

The study of contact time is essential to find the removal efficiency .The effect of contact time was conducted by adjusting the contact time of 10 mins interval from 10 to 15 mins .

The optimum dosage of chitosan is 1.5 mg/L .The optimum contact time of industrial waste water is 40 mins , the removal efficiency is 61.5 %.The sulphate reduction of chitosan adsorption at different contact time

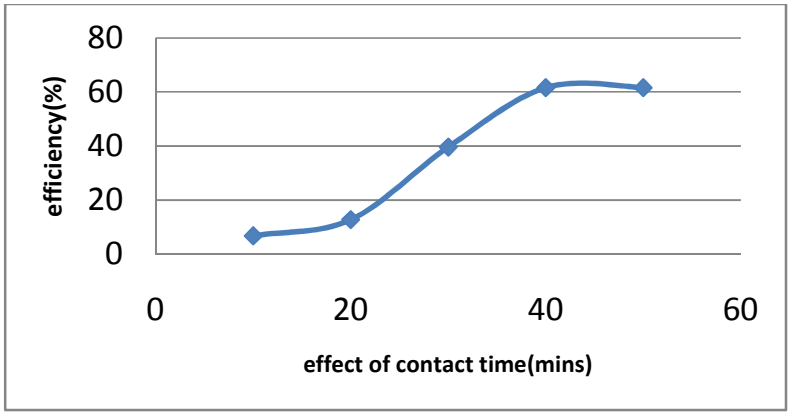

Fig no.3

d) CHITOSAN REMOVAL EFFICIENCY

In the final concentration of industrial wastewater , the all chemical characteristics which are tested initially for the initial concentration of the industrial wastewater as well as final characteristics of waste water by

using chitosan removal efficiency. The maximum sulphate ions removal percentage which was computed as 61.59% through usage of chitosn as an adsorbent.

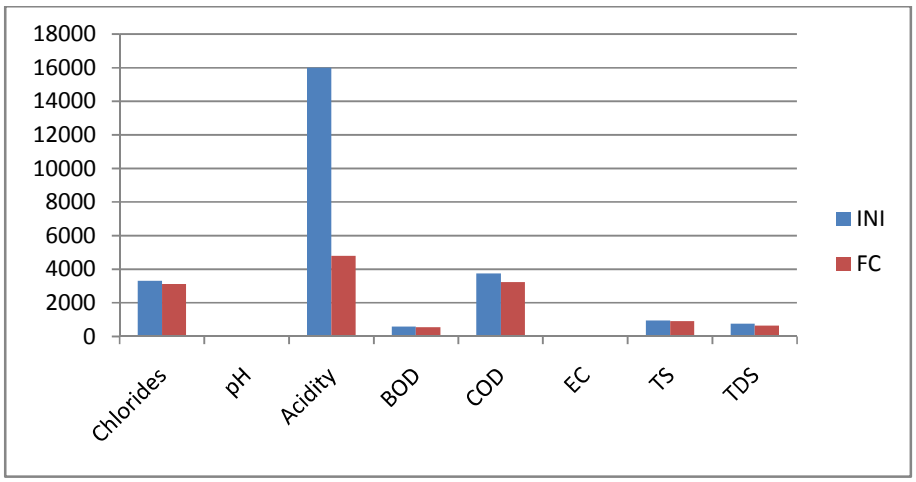

Fig no. 4

VI. CONCLUSION

This study assessed the feasibility of applying chitosan as the adsorbent to remove the sulphate from the industrial wastewater and it was found to be an effective adsorbent in adsorption. From the present study, it can be concluded that, the use of natural adsorbents like chitosan are receiving attention for their effectiveness in wastewater treatment.From the Experimental results, the optimum parameters of industrial wastewater, chitosan dosage is 1.5 mg/L and pH is 7.0. The industrial waste water contact time for the batch studies of both stock solution and industrial wastewater sample which is maintained in the regular interval of duration of 10 – 50 minutes. From the batch studies we are taken the maximum removal efficiency by varying the dosage and pH then optimum contact time. The maximum removal efficiency is 61.59%. Hence we conclude that treatment of industrial wastewater by chitosan.

REFERENCES

1. S A Puranik , " Chemical Industry Wastewater Treatment using Adsorption "

2 .Ullmann's encyclopaedia of industrial chemistry , Barbara Elvers et al 1988 , B3. 9.49.

3 Saito Toshihide& Hagiwara Kazuyoshi ,"Research survey on adsorbents in wastewater treatment " 1985.

4 Mohammed SadeqSalman , " Removal of sulphate from Wastewater by Activated Carbon" , Al- KhwariZmi Engineering Journal, vol. 5 , no.3 2009.
5. John G , " Adsorption technology and Design Wiley series " , UK , 1995.

6. Namasivayam , D. Sangeetha , " coconut coir pith for removal of sulphate" , vol. 219 , 2008.

7. UshakumaryE.R , Prof . Dr . G. Madhu , " Waste water Treatment Using Low cost Natural Adsorbents", Cochin University of Science and Technology. 2013
8. Upendrakumar&Manas.B , " Removal of cadmium from wastewater using treated Rice husk. 2006

9. "Uysal.M and Ar.I (2007) 'Removal of Cr(VI) from industrial waste waters by adsorption : partI: Determination of optimum conditions' Journal of Hazardous Materials, Vol.149.

10. Mishra.P.C and Patel.R.K , "Removal of lead and zinc ions from water by low cost adsorbents" Journal of Hazardous Materials, 2011.

11. Kadirvelu.K,Thamaraiselvi.K and Namasivayam.C "Removal of heavy metals from industrial wastewaters by adsorption activated carbon". 2001.

12. Wan.W.S.N and Hanfiah.M.A.K.M (2008) 'Removal of heavy metal ions from wastewater by chemically modified plant wastes as adsorbents: A review', Bioresourse Technology, Vol. 99, pp. 3935-3948.

13. SenthilKumar.P,Ramalingam.S,Sathyaselvabala.S,Kirupha.S.D and Sivanesan (2010) 'Removal of copper(II) ions from aqueous solution by adsorption using cashew nut shell' Desalination, Vol. 266(1-31), pp.63-71

14. Sohail.A,Ali.S.I,Khan.N.A and Rao.R.A.K (1999) 'Extraction of chromium from wastewater by adsorption' Journal of Environ. Pollut. Control, Vol.2, pp. 27-31

15. Ramos.R.L,Mendez.J.R.R,Barron.J.M,Rubio.L.F and Coronado.R.M.G (1997) 'Adsorption of Cd(II) from aqueous solution onto activated carbon' Water Sci. Technol., Vol.35, pp.205-2011.

