International Journal of Innovative Research and Advanced Studies (IJIRAS)
Volume 3 Issue 9, August 2016

ISSN: 2394-4404

Review Paper On Preparation Of Liquid Emulsion Membrane For Separation Of Phenol

Vinay Ashok Rangari

Ajinkya Vasant Deshmukh

Akshay Kishor Chaudhari

UG Students, Chemical Engineering Department, D.M.C.E, Airoli, Navi Mumbai, Maharashtra, India

Dr. Kalpana S Deshmukh

Chemical Engineering Department, D.M.C.E, Airoli, Navi Mumbai, Maharashtra, India

Abstract: ***Phenol is a major pollutant in the wastewater because of its presence in the effluent of major processing and refining plant. It has severe effect on human being. Various methods are used for removal of phenol from wastewater. Out of that, Our present study has been done to present the survey of the research on the separation of phenol from waste water using liquid emulsion membrane. These methods are reported to be efficient for the phenol separation and can be selected based on availability of the material, extent of separation required and properties of phenolic effluent.***

Index Terms: Phenol, Separation, Wastewater, Liquid Emulsion Membrane.

I. INTRODUCTION

Developing green and sustainable technology for the effluent treatment is very important research area in this era of industrial and social development. Many researchers carried out research in this field. It has its presence in the effluent from major chemical and pharmaceutical industries such as petroleum refining, coal gasification, manufacturing industries, petrochemical industries and pharmaceuticals industry. It has several short term and long term effect on human. Both flaura and fauna are adversely affected when phenolic waste water imparts to rivers, ponds.

Phenol separation is important because of increasing demand of phenol in global market and removal of phenol from phenol contaminated wastewater for reducing environmental pollution. We have prepared liquid emulsion membrane by various techniques to separate out phenol from the wastewater.

II. VARIOUS METHODS FOR PREPARATION OF LIQUID EMULSION MEMBRANE

We have prepared liquid emulsion membranes by following methods:

A. PREPARATION OF LEM USING KEROSENE

In this method we took 10 ml of kerosene in beaker and added 10 ml of castor oil in it. Mixture was stirred using magnetic stirrer at 200-250 rpm for 30 min. During stirring 10 ml of 0.1 N NaOH was added drop wise. This acted as our liquid emulsion membrane. After formation of globules 100 ml of phenol solution (100 ppm) was added to emulsion solution and stirred for 20 min at 1200-1500 rpm. The solution was allowed to settle. Two layers were formed the extract phase at top and raffinate phase at bottom. Raffinate phase was filtered and its pH and stability time were measured.

B. PREPARATION OF LEM USING WHITE EGG BULK

In this method 10 gm of white egg bulk was taken in a beaker and 10 ml of castor oil was added to it. This mixture

was stirred using magnetic stirrer at 200-250 rpm for 20 min. During mixing 10 ml of 0.1 N NaOH was added to the solution drop wise. After formation of globules 100 ml of phenol solution (100ppm) was added. The mixture was stirred for 20 minutes at 1500 rpm. The solution was allowed to settle and two layers were formed. Bottom layer was removed for pH and stability time measurement of liquid emulsion membrane. Procedure was repeated for changing ratio of white egg bulk and castor oil.

C. PREPARATION OF LEM USING MUSTARD POWDER

To 10 gm of Mustard powder 10 ml of castor oil was added in a beaker. This mixture was stirred using magnetic stirrer at 300-350 rpm for 20 min. During mixing 10 ml of 0.1 N NaOH solution was added drop wise. After formation of globules 50 ml of phenol solution (100ppm) was added. The mixture was stirred for 30 min. at 1300 rpm. Solution was allowed to settle. Two layers were formed. Bottom layer was removed for pH and stability time measurement of liquid emulsion membrane.

III. RESULT AND ANALYSIS

A. PHENOL REMOVED BY LIQUID - LIQUID EXTRACTION

Conc. in ppm	100	200	300	400	500	600	700
pH	7.42	7.48	7.52	7.58	7.68	7.75	7.80

Table 1

Conc. in ppm	100	200	300	400	500	600	700
pH	7.42	7.48	7.52	7.58	7.68	7.75	7.80

Table 2

B. PHENOL REMOVED USING EGG WHITE BULK

a. FOR 10 GM OF EGG WHITE BULK

Concentration in ppm	100	200	300	400	500	600	700
pH	8.15	8.32	8.50	8.67	8.85	9.00	9.15

Table 3

b. FOR 15 GM OF EGG WHITE BULK

Concentration in ppm	100	200	300	400	500	600	700
pH	8.60	8.75	8.92	9.05	9.20	9.37	9.50

Table 4

Kerosene in ml	10	15	20	25
Stability time of membrane in sec	600	820	980	1170

Table 5

C. MEMBRANE STABILITY BY USING MUSTARD POWDER

Concentration in ppm	100	200	300	400	500	600	700
pH	8.60	8.75	8.92	9.05	9.15	9.23	9.35

Table 6

Kerosene in ml	10	15	20	25
Stability time of membrane in sec	450	620	760	940

Table 7

IV. RESULTS OF EXPERIMENTS DONE WITH ACTUAL INDUSTRIAL WASTEWATER

We have performed experiments using actual industrial wastewater and following result were obtained:

Methods	Using Kerosene	Using White Egg Bulk	Using Mustard Powder
pH Reading	7.7	8	8.3

Table 8

Stability Methods	Using Kerosene	Using White Egg Bulk	Using Mustard Powder
Stability time of membrane in sec	620	470	350

Table 9

(Emulsifying agent used in all three methods quantity of 10 gm or ml)

It is observed that:

- ✓ The concentration of phenol and Ph increases in extract phase.
- ✓ As we increase the quantity of emulsifying agent, pH also increases.
- ✓ Out of three methods, Mustard powder method is more efficient in terms of pH and stability.
- ✓ The Mustard Powder responsible for the formation of globules and separate out phenol efficiently.

V. CONCLUSION

Liquid emulsion membrane process is better than all separation processes. It is a cheap process and easily controlled and maintained. Few obvious factors such as pH or heat do not break an emulsion. This method is used for heavy metal removal. In this experimental work up to 900 ppm of phenol was removed from 1000 ppm solution of synthetic water. Liquid emulsion membrane was prepared by different methods where pH value of all the samples and stability time of membrane was determined. This membrane was equally useful in removal of phenol from Waste water sample used in the study. It was observed that liquid emulsion membrane prepared using mustard powder is a highly efficient method in removal of phenol and time for stability of membrane was also observed to be less. ELM technology is proposed as an environmentally friendly treatment method to remove phenol and recover materials from wastewater using highly modified

ISSN: 2394-4404

chemical carriers in these types of liquid membranes. The future of ELM technology must move towards high efficiency, cost effectiveness and low toxicity.

REFERENCES

[1] Unit operation of chemical Engg./ fifth edition/ McGraw-hill international
[2] Perry, Handbook of membrane, Chemical Engineering Handbook, Tata McGraw hill.
[3] John J. McKetta, Encyclopaedia of chemical processing and design, Volume 18
[4] Fox, Emulsion and emulsion technology, part 2, Dekker, NewYork, 1974, pp. 733-850.
[5] D.B. Dhone, Plant utility, Nirali Prakashan
[6] Coulson and Richardson's Chemical Engineering, volume 2.