

EMULSION LIQUID MEMBRANE EXTRACTION AND DETERMINATION OF CIPROFLOXACIN WITH ALIQUAT-336

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Article Received on
14 Aug 2015,

Revised on 07 Sep 2015,
Accepted on 27 Sep 2015

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ABSTRACT

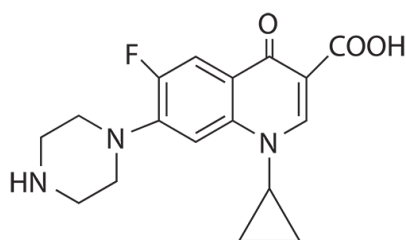
A novel method for the emulsion liquid membrane extraction and separation of antibiotic ciprofloxacin from 1.5mole/dm³ NaCl carbonate buffer pH(Varying) feed phase using aliquat-336 has been developed. Ciprofloxacin has been stripped from organic phase with NaCl buffer of pH 4.0 and determined spectrophotometrically at 272 nm. The method developed has been applied for the selective separation of ciprofloxacin from synthetic industrial effluent. The method developed is rapid, simple and excels most of the conventional techniques because of following merits such as low energy requirements, compact modular device, simultaneous extraction and stripping in the same device, zero pollution and use of mild to moderate process conditions.

KEYWORDS: Ciprofloxacin, Aliquot -336, Span 80.

INTRODUCTION

Ciprofloxacin (1-Cyclopropyl- 6-fluoro- 1,4 dihydro-4oxo-7-(1-Piperazinyl)-3-quinoline carboxylic acid) is a broad spectrum antibacterial agent. It is effective against anthrax (bacillus anthracis) used in bioterrorism. Other details of the drugs are as given as below:

It's empirical formula is C₁₇H₁₈FN₃O₃.HCl.H₂O. Structure of ciprofloxacin is as follows:



Molecular weight of ciprofloxacin is 385.82. It is sparingly soluble in water, slightly soluble in acetic acid and in methanol, very slightly soluble in dehydrated alcohol. Melting point of ciprofloxacin is 255-257 °C. It is antibacterial kind of drug, it is commonly used for curing enteric fever, specticaemia.

EXPERIMENTAL

Instruments

A UV-Visible (160-A) recording spectrophotometer (shimadzu), Control dynamics pH meter equipped with a combined glass electrode and magnetic stirrer, high speed homogenizer (Remi, India), were used for the absorbance and pH measurements and transport studies respectively.

REAGENTS

Stock solution of ciprofloxacin ($1\text{mg}/\text{cm}^3$) was prepared by dissolving 100 mg standard ciprofloxacin in 100 cm^3 of 1×10^{-2} mole/ dm^3 sodium hydroxide solution and working solution ($30\mu\text{g}/\text{cm}^3$) were prepared by suitable dilution of stock solution in 1×10^{-2} mole/ dm^3 NaOH. Aliquat-336 (Fluka Chemie AG) were used as supplied. All other chemicals such as toluene, sodium citrate, citric acid, sodium carbonate, sodium chloride and HCl were of AR grade.

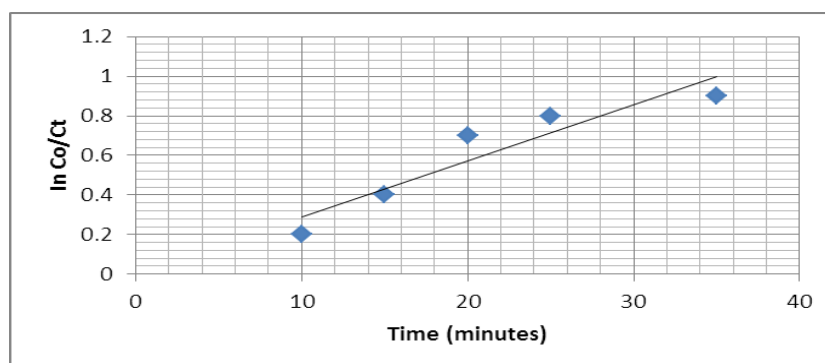
PREPARATION OF MEMBRANE

Membrane: 13 cm^3 span-80 + 15 cm^3 aliquat-336 diluted to 100 cm^3 with toluene.

PREPARATION OF EMULSION

ELM

10cm^3 of internal phase citrate buffer of pH=4.0 containing $1.0\text{ mole}/\text{dm}^3$ NaCl was added drop wise to a 5 cm^3 of membrane, stirred vigorously on a magnetic stirrer for 20 minutes to get stable milky white emulsion.



Kinetic curve of transport of Ciprofloxacin through ELM Process

Effect of pH of feed phase on percent Transport of Ciprofloxacin

Feed phase:- 50cm³ 1.5 mole/dm³ NaCl carbonate buffer pH(Varying) containing 30µg Ciprofloxacin.

Internal phase:- 10cm³ of 1.0 mol/dm³ NaCl in citrate buffer pH=4.0

Stirring time:- 25 minutes

Stirring speed:-300rpm

Temperature:-Room temperature

TABLE 1

Parameter	Optimum condition	Maximum % Transport
External Phase pH (8-10)	pH=10	88.23
Internal Phase pH (2-6)	pH=4	88.23
Stirring time (5-35 min)	25 min	88.23
Reagent concentration (5-20 % v/v)	15 % v/v	88.23
% of span 80 (6-16 % v/v)	13% v/v	88.23
Stirring speed (100-500 rpm)	300 rpm	88.23

Effect of Various Solvents on % Transport of Ciprofloxacin

Solvents	% Transport	R.S.D (n=3)	Solvent used
Ethyl acetate	65.46	0.24	Toluene
Dichloromethane	70.08	0.34	
Kerosene	70.01	0.21	
CCl ₄	34.72	0.24	
Toluene	88.23	0.19	

RECOVERY OF CIPROFLOXACIN FROM SYNTHETIC MIXTURE

Feed phase: 50cm³ 1.5 mole/dm³ NaCl carbonate buffer pH(Varying) containing 30µg Ciprofloxacin + Piperzine + 1- cyclopropyl – 6 – fluoro- 1,4- dihydro – 4 oxo, 7 chloro- 1yl- quinoline, 3- carbocyclic acid. (Varying conc.)

Synthetic mixture µg/50 cm ³	Recovery (%)	R.S.D (n=3)
(10µg) piperzine + (10µg) 1-cyclopropyl – 6- fluoro-1,4- dihydro-4-oxo, 7-chloro-1yl-quinoline, 3- carboxylic acid + (30µg) Ciprofloxacin	88.20	0.34
(30µg) piperzine + (30µg) 1-cyclopropyl – 6- fluoro-1,4- dihydro-4-oxo, 7-chloro-1yl-quinoline, 3- carboxylic acid + (30µg) Ciprofloxacin	88.32	0.30
(60µg) piperzine + (60µg) 1-cyclopropyl – 6- fluoro-1,4- dihydro-4-oxo, 7-chloro-1yl-quinoline, 3- carboxylic acid + (30µg) Ciprofloxacin	88.50	0.25

(100µg) piperzine + (100µg) 1-cyclopropyl – 6- fluoro-1,4-dihydro-4-oxo, 7-chloro-1yl-quinoline, 3- carboxylic acid + (30µg) Ciprofloxacin	88.39	0.41
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CONCLUSION

Application of the proposed method of transport of Ciprofloxacin using aliquat-336 as carrier as develop above has been tested for its suitability for the report of Ciprofloxacin from synthetic mixture of the effluent sample of the Ciprofloxacin manufacture. From the results, it is observed that the present method can be satisfactorily applied for the recovery of Ciprofloxacin from the waste mixture using aliquat-336.

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