

EFFECT OF COAGULATION BATH TEMPERATURE TO
THE STRUCTURE AND MEMBRANE SEPARATION
PERFORMANCE.

WILLIBRORD PETER

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EFFECT OF COAGULATION BATH TEMPERATURE TO THE STRUCTURE
AND MEMBRANE SEPARATION PERFORMANCE.

Willibrord Peter

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Kotak Jajir:

Nama:

Cop Rasmi:

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FAKULTI SAINS DAN TEKNOLOGI
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA

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Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk:
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MEMBRANE STRUCTURE AND PERFORMANCE
oleh Willibrord Peter, No. Matrik UK 7366 telah diperiksa dan semua pembetulan
yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains
Kejuruteraan sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah
Sarjana Muda Teknologi (Alam Sekitar), Fakulti Sains dan Teknologi, Kolej
Universiti Sains dan Teknologi Malaysia.

Disahkan oleh:

Penyelia Utama

Nama: DR. NORA'AINI BINTI ALI
Pensyarah
Jabatan Sains Kejuruteraan
Fakulti Sains dan Teknologi
Kolej Universiti Sains dan Teknologi Malaysia
21030 Kuala Terengganu.

Tarikh: 20.4.05

Penyelia Kedua (jika ada)

Nama: ASMADI BIN ALI @ MAHMUD
Pensyarah
Jabatan Sains Kejuruteraan
Fakulti Sains dan Teknologi
Kolej Universiti Sains dan Teknologi Malaysia
21030 Kuala Terengganu.

Tarikh: 20.4.05

Ketua Jabatan Sains Kejuruteraan

Nama: AHMAD JUSOH
Pensyarah
Jabatan Sains Kejuruteraan
Fakulti Sains dan Teknologi
Kolej Universiti Sains dan Teknologi Malaysia
21030 Kuala Terengganu.

Tarikh: 21.4.05

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Kerna Jambatan

Nama:

Cap Rango:

LIST OF CONTENTS

FRONT COVER	i	
THESIS APPROVAL FORM	ii	
ACKNOMLEDGEMENTS	iii	
LIST OF CONTENTS	iv	
LIST OF TABLES	vii	
LIST OF FIGURES	viii	
ABBREVIATION/SYMBOLS	ix	
LIST OF APPENDIXES	xi	
ABSTRACT	xii	
ABSTRAK	xiii	
CHAPTER 1	INTRODUCTION	
1.1	Definition of Membrane	1
1.2	Basic Principle of Membrane Processes	2
1.3	Membrane Development History	4
1.4	Problem Statement	7
1.5	Research Objective	8
1.6	Scope of Research	9

CHAPTER 2	LITERATURE REVIEW	
2.1	Membrane And Its Application	10
2.2	Membrane Preparation	11
2.3	Asymmetric Membrane	11
2.4	Selection of Polymer-Solvent and Non-Solvent (Precipitant) System	12
2.4.1	Polyethersulfone	14
2.4.2	Solvent (N-methyl-2-pyrrolidone)	14
2.4.3	Non-solvent	15
2.5	Polymer Concentration	15
2.6	Effect of Internal Coagulant	16
2.7	Effect of Coagulation Bath (gelation media) Temperatures to the Membrane Flux and Rejections	17
2.8	Membrane Process Phase Inversion	19
2.9	Limitation of Membrane Processes	21
2.9.1	Concentration polarisation	22
2.10	Nanofiltration Membrane	23
CHAPTER 3	METHODOLOGY	
3.1	Materials	25
3.2	Dope Preparation	26
3.3	Membrane Preparation	27
3.4	Preparation of Testing Solution (NaCl)	28
3.4.1	Dilution of Salt	28
3.4.2	Stock Solution Dilution	29

3.4	Membrane Testing (Performance Evaluation)	29
3.6	Membrane Characterization	31
CHAPTER 4	RESULTS AND DISCUSSIONS	
4.1	Mechanism of produced Membrane during Wet Phase Inversion	39
4.2	Pure water Flux and Sodium Chloride Rejection Measurement	40
4.3	The Effect of Coagulation Bath Temperature To The Membrane Permability	40
4.4	Effect of Coagulation Bath Temperature to the Rejection of Sodium Chloride.	44
4.5	Rejection of Sodium Chloride as a Function of Applied Pressure.	46
4.6	Effect of Coagulation Bath Temperature to the Membrane Structures.	49
CHAPTER 5	CONCLUSION AND RECOMMENDATIONS	
5.1	Conclusion	52
5.2	Recommendations	54
REFERENCES		55
APPENDIX		59
VITAE		68

LIST OF TABLE

Table		Page
1.1	Technical Development of Membranes	7
3.1	Summary for the Asymmetric Membrane Formation.	28
3.2	The solute radius and diffusivity of NaCl	35
3.3	The obtained values of diffusion coefficient for selected salt	35
4.1	Permeability of Membranes	42
4.2	Relation between permeability and rejection as a function of different Coagulation bath temperatures applied.	45
4.3	Relation between permeability, flux and rejection as function of different Coagulation bath temperatures applied.	48

LIST OF FIGURES

Figure	Page
2.1 Molecular Chain of Polyethersulfone	14
2.2 Chemical structure for NMP	15
2.3 Schematic Drawing of Wet Phase Inversion	21
3.1 Preparation of Casting Solution	26
3.2 Membrane Casting Machine	27
3.3 Formation of Membrane in Coagulation Bath	27
3.4 Dead-End Filtration set up	31
3.5 Scanning Electrone Microscope	36
3.6 flow chart indicating the whole methodology experimental unit	37
4.1 Schematic Drawing of Non-Solvent/Solvent Exchange Process at the Coagulation Media/Polymer Solution Interface	39
4.2 (a) Dependence of flux as a function of pressure for membrane coagulated at 27°.	41
4.2 (b) Dependence of flux as a function of pressure for membrane coagulated at 5°.	41
4.2 (c) Dependence of flux as a function of pressure for membrane coagulated at 50°.	41
4.3 Dependence of NaCl rejection as a function of applied Pressure for membrane coagulated at 27°.	44
4.4 The Dependence of Flux and Rejection as a Function of Applied Pressure	47
4.5 Scanning electronic photomicrograph of membrane coagulated At different temperature: (a) PES-50°C, (b) PES-5°C,(c) PES-27°C.	

ABBREVIATION/ SYMBOLS

DD	-	Diffusion Dialysis
DMAc	-	N,N-Dimethyl-Acetamide
ED	-	Electrodialysis
INOS	-	Institute Oceanography
MF	-	Microfiltration
ME	-	Membrane Electrolysis
Mol	-	Molar
mL	-	Millilitre
NF	-	Nanofiltration
NMP	-	N-Methyl-2-Pyrrolidone
Nm	-	Nanometer
NaCl	-	Natrium Chloride/Sodium Chloride
PVDF	-	Polyvinylidene Fluoride
PES	-	Polyethersulfone
RO	-	Reverse Osmosis
SEM	-	Scanning Electronic Microscope
UF	-	Ultrafiltration
A	-	Area of Membrane (m ²)
C _p	-	Concentration of Salt in the Permeate
C _f	-	Concentration of Salt in the Feed

ABBREVIATION/SYMBOL

G	-	Gram
J _v	-	Flux ($\text{m}^3/\text{m}^2 \text{ sec}$)
M	-	Wanted Molar of Salt
MW	-	Molecular Weight of Salt
M1	-	Wanted Molar of salt Solution
M2	-	Known Molar of Salt
P _m	-	Permeability of Membrane ($\text{m}^3/\text{m}^2 \text{ sec mPa}$)
ΔP	-	Applied Pressure (bar/Pa)
R(%)	-	Rejection Solute in Percentage
T	-	Time of Permeation Taken (sec)
V	-	Volume of salt Diluted in mL
V1	-	Volume of Salt Solution
V2	-	Volume of Salt Solution Need to be Pipette
v	-	Volume of Permeate(m^3)
C _b	-	Concentration of Salt in the Bulk

APPENDIX

- A Preparation for Casting Solution of 100 mL
- B Preparation For Stock Solution of NaCl (0.1M)
- C Schematic Operational Principal for Stirred Cell
- D (a) Tables and Graphs For Permeability and Rejection for Membrane
Coagulated at 27°C.
- D (b) Tables and Graphs For Permeability and Rejection for Membrane
Coagulated at 5°C.
- D (c) Tables and Graphs For Permeability and Rejection for Membrane
Coagulated at 50°C.

ABSTRACT

The aim of this study was to investigate the effect of coagulation bath temperature to the membrane structure and performance. This parameter is important to be studied as the coagulation bath temperature effect directly to the separation performance and structure of membrane. Asymmetric flat sheet membrane were developed using a ternary system consisted of 21 polymer from Polyethersulfone, 72% solvent from N-methyl-2-pyrrolidone and 7% of water fabricated using electrically controlled semi-automated casting machine. The membrane cast was studied in different coagulation bath temperature of 5°C, 27°C and 50°C. The effect of the coagulation medium was measured in terms of pure water flux and rejections as a function of applied pressure to Sodium Chloride solution with concentration of 0.01 molar. The results of this study showed that coagulation bath temperature effect directly to the permeability of pure water and retention to sodium chloride rejection. The increasing of coagulation bath temperature resulted in higher permeability of membrane but lower rejection to sodium chloride while decreasing the coagulation bath temperature resulted in lower permeability of membrane but higher rejection to sodium chloride. The membrane prepared with coagulation bath temperature of 5°C shows the highest rejection for sodium chloride with 27 % of rejection. While for 27°C of coagulation bath managed to reject 22% of sodium chloride and the membrane prepared with coagulation bath temperature of 50°C only rejected 17% of the sodium chloride. The results obtained were coherent with the theory of the coagulation bath temperature effect even though fabricated under different conditions and materials.

ABSTRAK

Tujuan kajian ini dijalankan adalah untuk mengetahui kesan suhu larutan pengental kepada struktur dan pengaruh pemisahan membran terhadap larutan garam. Parameter ini penting untuk dikaji kerana suhu larutan pengental didapati bertindak secara terus kepada prestasi dan struktur membran. Dalam kajian ini membran kepingan rata daripada sistem ternari disediakan melalui fasa basah balikan yang terdiri daripada polimer berkompposisi 21 % polietersulfona, 72% pelarut dari N-metil-2-pirolidon dan 7% air dan dihasilkan menggunakan mesin pengacuan elektrik semi-automatik. Membran yang terhasil diuji dalam beberapa larutan pengental yang berlainan suhu iaitu 5°C, 27°C dan 50°C. Penilaian prestasi membran diuji dari segi ketelapan terhadap air tulen dan pemisahan kepada larutan garam berkepekatan 0.01 molar. Hasil kajian terhadap kesan suhu larutan pengental terhadap kecekapan membran mendapati, apabila suhu larutan pengental adalah tinggi, kadar ketelapan membran terhadap air adalah tinggi namun kecekapan pemisahan membran terhadap larutan natrium klorida adalah rendah. Kesan yang sebaliknya apabila suhu larutan pengental adalah rendah, dimana kadar ketelapan terhadap air adalah rendah namun dapat memisahkan larutan garam dengan tinggi. Daripada eksperimen yang dibuat, didapati membran yang dihasilkan daripada larutan pengental bersuhu 5°C menunjukkan pemisahan terhadap garam yang paling tinggi iaitu 27%, manakala membran yang dihasilkan dengan larutan pengental pada suhu 27°C dapat memisahkan 22% larutan garam dan membran yang dihasilkan pada suhu 50°C untuk larutan pengental hanya dapat memisahkan sebanyak 17% larutan air garam. Daripada hasil kajian yang diperolehi, didapati pengaruh suhu larutan pengental terhadap membran mempunyai persamaan dengan teori walaupun di hasilkan daripada bahan dan keadaan yang berbeza.