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

WILLIBRORD PETER

FAKULTI SAINS DAN TEKNOLOGI
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA

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Willibrord Peter

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JABATAN SAINS KEJURUTERAAN
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KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA

PENGAKUAN DAN PENGESAHAN LAPORAN
PROJEK PENYELIDIKAN I DAN II

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk:
THE EFFECT OF COAGULATION BATH TEMPERATURE TO THE 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

Cop Rasmi: 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

Cop Rasmi: 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:

Cop Rasmi:

Tarikh: 21.4.05

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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)
Cp	-	Concentration of Salt in the Permeate
Cf	-	Concentration of Salt in the Feed

ABBREVIATION/SYMBOL

G	-	Gram
Jv	-	Flux (m^3/m^2 sec)
M	-	Wanted Molar of Salt
MW	-	Molecular Weight of Salt
M1	-	Wanted Molar of salt Solution
M2	-	Known Molar of Salt
Pm	-	Permeability of Membrane (m^3/m^2 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)
Cb	-	Concentration of Salt in the Bulk

APPENDIX

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 Natrium 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 di sediakan melalui fasa basah balikan yang terdiri daripada polimer berkomposisi 21 % polietersulfona, 72% pelarut dari N-metil-2-pirolidon dan 7% air dan dihasilkan menggunakan mesin pengacuan elektrik semi-aoutomatik. 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.