

CHARACTERIZATION OF POLYMER MEMBRANES
SEPARATION PROCESSES BASED ON
MEMBRANE TECHNOLOGY

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CHARACTERIZATION OF BOVINE SERUM ALBUMIN SEPARATION
PROCESS BASED ON MEMBRANES TECHNOLOGY

By
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JABATAN SAINS KEJURUTERAAN
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LIST OF SYMBOLS

Abbreviation

BSA	Bovine Serum Albumin
C_p	Concentration of permeate solution
C_f	Concentration of feed solution
C_r	Concentration of retentate solution
C_b	Bulk concentration
k	Mass transfer coefficient
IEP	Isoelectric Point
MF	Microfiltration
MW	Molecular weight
NaCl	Sodium Chloride
NMP	N- methyl- 2- pyrrolidone
PSf	Polysulfone
SEM	Scanning Electron Microscopy
UF	Ultrafiltration

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APPENDIX

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- B Flux and NaCl Rejection for PSf UF Membrane at Different Polymer Concentrations
- C Flux and Rejection of BSA for PSf UF membrane at Different Polymer Concentrations
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ABSTRACT

The development and applications of membrane technology has becoming miscellaneous and nowadays many new findings have been published. To date, technology of membrane was become the alternative technology that very competitive and gave the various solutions for human in implementing their daily needs. But, for the potential of its use for protein fractionation is largely unexploited. Therefore, this study is carried out to determine the best ternary formulation to develop ultrafiltration membranes for *Bovine Serum Albumin* (BSA) separation and to discover the highest rejection of the BSA at different pH values and concentrations. The membrane was fabricated from a ternary composition consisting of Polysulfone (PSf), N-methyl-2-pyrrolidone (NMP) and water (H₂O) with different polymer concentrations by a simple dry/wet phase inversion. The membrane morphology and structure has been characterized by using Scanning Electron Microscope (SEM). The BSA was analyzed by using UV- Vis Spectrophotometry. This study was proposed the PSf 17wt.% as the superselective membrane for BSA separation at different values of pH and concentrations. As a result, this membrane gave the highest rejection, 100% of BSA at pH 7.6 and concentration of 0.5 mg/ml. This circumstance shows that the rejection of BSA is feasible increased when the pH value of BSA is increased. The concentrations of solute also affecting the rejection value which is the lower solute concentrations give the higher percentage rejection of BSA.

ABSTRAK

Perkembangan dan aplikasi teknologi membran semakin bervariasi dan penemuan-penemuan baru pula semakin banyak diterbitkan. Teknologi membran akhirnya menjadi salah satu teknologi alternatif yang paling kompetitif saat ini dan telah memberikan pelbagai penyelesaian bagi manusia dalam memenuhi keperluan harian. Namun begitu, keupayaan teknologi membran dalam proses pemisahan protein tidak diaplikasikan dengan meluas. Oleh demikian, kajian ini akan dijalankan untuk menyelidik formula yang terbaik bagi membran penuras ultra bagi penapisan *Bovine Serum Albumin* (BSA) serta mengkaji kadar penyingkiran tertinggi bagi BSA pada nilai pH dan kepekatan yang berbeza. Membran yang dihasilkan adalah daripada komposisi tiga bahan iaitu Polysulfone (PSf), N-methyl-2-pyrrolidone (NMP) dan air (H₂O) dengan kepekatan polimer yang berbeza melalui kaedah ringkas pembalikan fasa kering/ basah. Struktur dan morfologi membran akan dicirikan dengan menggunakan Mikroskop Pengesan Elektron (SEM). Manakala BSA pula telah dianalisis dengan menggunakan alat Spektrofotometer UV- Vis. Kajian ini mencadangkan bahawa membran PSf 17wt.% adalah membran terbaik bagi proses pemisahan BSA pada nilai pH dan kepekatan yang berbeza.. Sebagai keputusannya, membran ini memberi kadar penyingkiran tertinggi BSA, 100% iaitu pada pH7.6 dan berkepekatan 0.5 mg/ml. Keadaan ini menunjukkan bahawa kadar penyingkiran BSA meningkat apabila nilai pH BSA meningkat. Kepekatan larutan juga turut mempengaruhi kadar penyingkiran BSA dimana larutan berkepekatan lebih rendah memberi nilai peratusan penyingkiran BSA yang lebih tinggi.