

EFFECT OF ADDITIVE ON THE MEMBRANE PERFORMANCE
AND MEMBRANE STRUCTURE

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MEMBRANE STRUCTURE

By

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Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk:

EFFECT OF ADDITIVE ON THE MEMBRANE PERFORMANCE AND MEMBRANE
STRUCTURE

oleh WONG LING YONG

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LIST OF ABBREVIATIONS / SYMBOLS

INOS	Institute of Oceanography
NaCl	Sodium Chloride
NF	Nanofiltration
NMP	<i>N</i> -methyl-2-pyrrolidinone
PES	Polyethersulfone
PSF	Polysulfone
PVP	Polyvinylpyrrolidone
RO	Reverse Osmosis
SEM	Scanning Electron Microscopy
UF	Ultrafiltration

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APPENDIX

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ABSTRACT

In order to prepare high performance of membrane filtration, an experiment using quaternary system was carried out with widely used membrane - Polyethersulfone (PES) as polymer, *N*-methyl-2-pyrrolidinone (NMP) as solvent, water as non-solvent, and polyvinylpyrrolidone (PVP) as additive. Water was used as coagulation bath and methanol as post treatment. In this study, effect of additive concentration on the membrane performance was studied. By undergoing this study, effect of additive can be identified in order to improve membrane performance. Three membranes with different additive concentrations (5 wt.%, 7 wt.%, and 9 wt.%) were tested to find out the flux produced and rejection to the salt water by each membrane. The method used was wet phase inversion. The results obtained shows that the membrane with 9 wt.% of PVP produced the most flux than the others. Flux produced was in a range between 4.231×10^{-6} m/s and 6.301×10^{-6} m/s. Meanwhile, the highest rejection for salt water was obtained by membrane with 7 wt.% of additive, which reject in a range between 53% and 60%. Morphology of each membrane was studied using Scanning Electron Microscopy (SEM). Structure of membrane had shown that membrane with PVP concentration of 7 wt.% was having more well formed finger like structure and macro voids formation than the one with 5 wt.% and 9 wt.%.

ABSTRAK

Untuk membolehkan penghasilan membran penuras yang berpretasi tinggi, satu eksperimen menggunakan sistem kuaternari telah dijalankan dengan menggunakan membran yang luas penggunaannya - Polyethersulfone (PES) sebagai polimer, *N*-methyl-2-pyrrolidinone (NMP) sebagai pelarut, air sebagai bukan pelarut, dan polyvinylpyrrolidone (PVP) sebagai aditif. Air telah digunakan sebagai larutan pengental dan metanol sebagai rawatan lanjutan. Dalam kajian ini, kesan aditif terhadap membran telah dikaji. Dengan menjalani kajian ini, kesan aditif dapat dikenalpasti dan membantu dalam peningkatan mutu membran. Tiga membran dengan kandungan editif berlainan (5 wt.%, 7 wt.%, dan 9 wt.%) masing-masing telah dikaji untuk mengetahui kebolehan dalam penghasilan fluks dan penyingkiran garam. Cara yang digunakan dalam proses ini ialah fasa balikan basah. Keputusan yang didapati menunjukkan membran dengan PVP 9 wt.% telah menghasilkan fluks yang terbanyak jika dibanding dengan yang lain. Fluks yang dihasilkan adalah dalam lingkungan 4.231×10^{-6} m/s dan 6.301×10^{-6} m/s. Manakala penyingkiran garam yang terbanyak ialah membran dengan kandungan PVP 7 wt.%, dalam lingkungan 53% dan 60%. Morfologi setiap membran turut dikaji menggunakan pengimbas elektron mikroskopik (SEM). Struktur membran yang diperhati menunjukkan bahawa membran yang mengandungi PVP 7 wt.% menghasilkan struktur jejari dan lompong makro yang lebih sempurna daripada membran yang mengandungi PVP 5 wt.% dan PVP 9 wt.%.