THE INFLUENCE OF POST-TREATMENT (SOLVENT EXCHANGE) ON THE PERFORMANCE AND STRUCTURE OF NANOFILTRATION MEMBRANE

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The influence of post-treatment (solvent exchange) on the performance and structure of Nanofiltration membrane

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LIST OF ABBREVIATION

Symbol	
DD	Diffusion Dialysis
ED	Elecrodialysis
INOS	Institute Oceanography
MC	Membrane Contactors
MD	Membrane Distillation
ME	Membrane Electrolysis
MF	Microfiltration
NaCl	Sodium Chloride
NF	Nanofiltration
NMP	*N*-methyl-2-pyrrolidone
PES	Polyethersulfone
PV	Pervaporation
PVP	Polyvinylpyrrolidone
PWF	Pure Water Flux
RO	Reverse Osmosis
SEM	Scanning Electron Microscope
UF	Ultrafiltration
γ	Shear Rate
wt.%	Percentage of weight

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ABSTRACT

The aim of this study was to investigate the influence of post-treatment (solvent exchange) towards performance and structure of nanofiltration membrane. Asymmetric membranes were developed by dry/wet phase inversion method from casting solution contains 18% polyethersulfone (PES) as polymer, 75% *N*-methyl-2-pyrrolidone (NMP) as solvent and 7% polyvinylpyrrolidone (PVP) as additive. Three different organic solvents (methanol, ethanol and n-hexane) used in this study as post treatment medium to identifying their influence on the performance and structure of membrane and the results were compared with an untreated membrane. The 0.01 M sodium chloride salt rejection percentage obtained from post-treated membranes is in following sequence: methanol treated membrane > n-hexane treated membrane > ethanol treated membrane while for 0.01 M NaCl salt flux, the following trends were observed: n-hexane treated membrane > methanol treated membrane > ethanol treated membrane. Thus, untreated membrane showed a very low sodium chloride salt rejection percentage and salt flux at low pressure. Therefore, membrane treated in methanol has high selectivity while membrane treated in n-hexane has high flux. On the other hand, membrane without any post-treatment is low selectivity and flux.

ABSTRAK

Kajian ini telah dijalankan bertujuan untuk mengkaji kesan pengaruh rawatan lanjutan (penukargantian pelarut) terhadap prestasi dan struktur membran penuras nano. Membran asimetrik telah disediakan melalui kaedah fasa pembalikan basah/kering dengan meggunakan larutan acuan yang mengandungi 21% polyethersulfon (PES) sebagai polimer, 75% *N*-metil-2-pirrolidon (NMP) sebagai pelarut dan 7% polyvinylpirrolidon (PVP) sebagai aditif. Tiga pelarut organik (metanol, etanol dan n-hexana) telah digunakan dalam kajian ini sebagai medium rawatan lanjutan dalam mengenalpasti pengaruh mereka terhadap prestasi dan struktur membran dan keputusan yang didapati telah dibandingkan dengan membran yang tidak menjalani rawatan lanjutan. Peratus penyingkiran 0.01 M garam natrium klorida yang telah didapati daripada membran yang telah menjalani rawatan lanjutan adalah dalam turutan berikut: membran dirawat dalam metanol > membran dirawat dalam n-hexana > membran dirawat dalam etanol manakala aliran berikut didapati bagi fluks air garam 0.01 M natrium klorida: membran dirawat dalam n-hexana > membran dirawat dalam metanol > membran dirawat dalam etanol. Membran yang tidak menjalani rawatan telah menunjukkan peratusan penyingkiran garam natrium klorida dan fluks air garam natrium klorida yang amat rendah pada tekanan yang rendah. Oleh yang demikian, membran yang dirawat dalam metanol mempunyai kepemilihan yang tinggi manakala membran yang dirawat dalam n-hexana mempunyai kesan fluks yang tinggi. Membran tanpa rawatan lanjutan menunjukkan kepemilihan dan fluks yang rendah.