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FAKULTI SAINS DAN TEKNOLOGI
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Lihat sebelah

DEVELOPMENT OF PERMSELECTIVE MEMBRANES FOR APPLICATION OF *ENTEROCOCCUS FAECALIS* REMOVAL

By

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Research Report submitted in partial fulfillment of
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BORANG PENGAKUAN DAN PENGESAHAN LAPORAN PROJEK PENYELIDIKAN I DAN II

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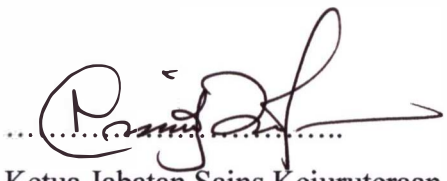

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Abbreviation	
cfu	Colony forming units
DMAc	N-N-dimethylacetamide
DMF	N, N-dimethylformide
DMSO	Dimethylsulfoxide
*G*v	Coagulation value
INOS	Institute of Oseanography
M	Molar
MF	Microfiltration
MP	Morpholene
MPN	Most Probably Number
MWCO	Molecular weight Cut-off
NaCl	Sodium chloride
NA	Nutrient agar
NMP	*N*-methyl-2-pyrrolidinone
NSA	Non-solvent additive
PEI	Polyetherimide
PEG	Polyethylene glycol
PES	Polyethersulfone
PI	Polyimide

PSf	Polysulfone
PVP	Polyvinylpyrrolidone
PWP	Pure Water Permeation
RO	Reverse Osmosis
SEM	Scanning Electron Microscope
T_g	Glass transition temperature
UF	Ultrafiltration
UMT	University Malaysia Terengganu

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ABSTRACT

Enterococcus continues to create new therapeutic problems and dilemmas since it has the ability to spread penicillin and vancomycin resistance to other gram positive species. In order to ensure removal and inactivation of enterococcus, increasing the dose for chemical disinfectant, chlorine, is required which may result in higher concentration of oxidation by-product that may cause cancer. Membranes are now being used for bacteria removal as it can improve the water quality while avoiding formation of carcinogens. This study is conducted to develop membranes with different polymer concentrations which were 10%, 15% and 16% as well as different additives (PVP and PEG) and obtain the best formulation which can produce high performance ultrafiltration membrane in removal of *Enterococcus faecalis*. PSf 10 achieved the highest permeability for pure water permeation test and sodium chloride rejection for solute rejection test as well as highest flux and 100% rejection in removing of *E. faecalis*. The sponge-like and macrovoids structure of PSf 10 as shown in SEM image has demonstrated the highest permeability characteristic of the membrane. The result obtained shows that the use of additives also influences the flux and solute rejection as well as application of membrane. The uniform and larger finger-like structure of membrane fabricated with PVP shown in SEM images can support the reason it exhibits higher flux and NaCl rejection compared to PEG. These findings support PSf 10 as the best formulation in this studies which eventually being chosen as the best formulation in bacteria removal application.

ABSTRAK

Enterococcus menyebabkan masalah dan dilema yang berterusan kerana kebolehannya untuk menyebarkan penentang penisilin dan *vancomycin* kepada bacteria gram positif yang lain. Untuk memastikan penyingkiran dan ketidakgiatan enterococcus, dos tambahan bahan kimia diperlukan, akibatnya menyebabkan peningkatan kepekatan bahan sampingan penyebab kanser yang terhasil. Membran telah digunakan pada masa kini untuk rawatan air di samping mengelakkan pembentukan *carcinogen*. Kajian ini dijalankan untuk menghasilkan membran dengan kepekatan polimer yang berbeza iaitu 10%, 15% dan 16% serta penggunaan aditif yang berbeza serta memilih antara yang terbaik dari segi ketelapan dan kebolehpilihan serta kecekapan penyingkiran *Enterococcus faecalis*. PSf 10 mencapai ketelapan air suling dan kebolehpilihan air garam yang paling tinggi antara semua membran yang dihasilkan serta menunjukkan ketelapan dan kebolehpilihan yang tertinggi dalam aplikasi penyingkiran *E. faecalis*. Struktur span yang dipaparkan dalam imej SEM menunjukkan ciri-ciri fizikalnya dalam mencapai kebolehpilihan yang paling tinggi dalam penyelidikan. Penggunaan aditif yang berbeza mempengaruhi kecekapan membran dalam ketelapan dan kebolehpilihan serta applikasi membran. Imej SEM menunjukkan struktur PVP dengan *finger-like* yang teratur menerangkan alasan membrane yang dihasilkan dengan PVP menunjukkan ketelapan dan kebolehpihan yang lebih tinggi berbanding PEG. Penemuan dalam kajian ini menunjukkan PSf 10 adalah formulasi yang paling baik dalam penyelidikan ini yang akhirnya dipilih sebagai formulasi membran yang paling baik dalam aplikasi penyingkiran *E. faecalis*.