

PERFORMANCE EVALUATION OF A SYNTHETIC
MEMBRANE FOR
REMOVAL OF PESTICIDES

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PERFORMANCE EVALUATION OF ASYMMETRIC NANOFILTRATION
MEMBRANE FOR REACTIVE DYE REMOVAL

By
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**JABATAN SAINS KEJURUTERAAN
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**PENGAKUAN DAN PENGESAHAN LAPORAN
PROJEK PENYELIDIKAN I DAN II**

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk:

PERFORMANCE EVALUATION OF ASYMMETRIC NANOFILTRATION MEMBRANE FOR REACTIVE DYE REMOVAL oleh MENAKA A/P HARIKARISIN. No.Matrik UK7710 telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Kejuruteraan sebagai memenuhi sebahagian daripada keperluan memperoleh Ijazah SARJANA MUDA TEKNOLOGI (ALAM SEKITAR), Fakulti Sains dan Teknologi, Universiti Malaysia Terengganu.

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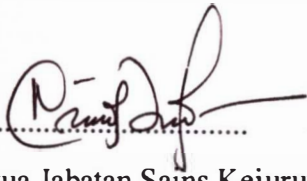
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ABSTRACT

Nanofiltration membrane separation process is becoming an alternative treatment technology to treat dye-containing effluent because it is technically and economically feasible. Conventional treatments methods such as coagulation, activated carbon, ozonation and Fenton reagent are not feasible to recycle and reuse dye bath effluent in dyeing processes. Advantages of nanofiltration technology are the dye bath effluent can be recycled and reuse in dye bath processes, low cost and the system offer flexible application potential. Application of nanofiltration for reactive dye removal is entitled to ionic strength of solute and membrane. Thus, a study to investigate the effects of shear rate and the influence of sodium chloride (NaCl) concentration on removal of reactive dyes has been performed. Asymmetric nanofiltration membranes were produced using binary dope composition consists of Polysulfone and N-methyl-2-pyrrolidone by a dry/wet phase inversion technique using electrically controlled flat sheet membrane casting machine. Based on the performance evaluation according to shear rate on Reactive Black 5 (RB5) membrane with shear rate 175.0s^{-1} demonstrate high removal rate of 84.00%. It is followed by 116.7s^{-1} and 87.5s^{-1} . The analysis on effects of NaCl in removal of RB5 was conducted with 175.0s^{-1} shear rate membrane. The better removal of RB5 was 77.32 % obtained at 0.01 M NaCl and this is followed by 0.10 M NaCl and 1.00 M NaCl. This study has proposed that the membrane with higher shear rate and low NaCl concentration in RB5 performed good removal of RB5. This research indicated that shear rate and ionic strength of membrane affects the membrane performance and consecutively enhanced the membranes ability for RB5 removal.

ABSTRAK

Membran penurasan nano merupakan teknologi rawatan alternatif air sisa kumbahan pewarna daripada industri tekstil kerana ia munasabah dari segi teknik dan ekonomi. Rawatan air sisa tekstil yang sedia ada seperti pembekuan, rawatan ozon dan reagen Fenton tidak sesuai untuk di kitar semula atau diguna semula dalam proses pewarnaan tekstil. Kebaikan teknologi membran adalah air sisa tekstil boleh dikitar semula atau diguna semula dalam proses pewarnaan, ia berkos rendah dan fleksibel. Aplikasi penuras nano dalam penyingkiran pewarna reaktif dipengaruhi oleh daya ionik daripada membran dan larutan. Satu kajian menyelidik kesan kadar ricih dan kepekatan garam (NaCl) dalam penyingkiran pewarna reaktif telah dilaksanakan. Membran asimetrik penuras nano telah disediakan dengan menggunakan teknik fasa balikan kering/basah, dengan larutan membran binari yang terdiri daripada Polisulfon dan N-metil-2-pirolidona dengan mesin penghasilan kepingan rata elektrik. Daripada penilaian prestasi kesan kadar ricih terhadap penyingkiran pewarna reaktif hitam 5 (RB5), membran dengan kadar ricih 175.0s^{-1} menunjukkan nilai penyingkiran yang tinggi iaitu 84.00%. Ini diikuti dengan membran kadar ricih 116.7s^{-1} dan 87.5s^{-1} . Kajian kesan NaCl terhadap penyingkiran RB5 telah dilaksanakan dengan membran kadar ricih 175.0s^{-1} . Pada kepekatan NaCl 0.01 M dalam larutan RB5 menunjukkan penyingkiran RB5 yang baik iaitu 77.32% dan ini diikuti oleh kepekatan NaCl 0.10 M dan 1.00 M. Daripada kajian ini dicadangkan bahawa membran dengan kadar ricih tinggi dan kepekatan NaCl rendah menunjukkan prestasi penyingkiran RB5 yang baik. Kajian ini membuktikan bahawa kadar ricih dan kepekatan NaCl memberikan kesan terhadap prestasi membran dan penyingkiran RB5.