

SYNTHESIS AND CHARACTERIZATION OF
POLYETHERSULPHONE ASYMMETRIC NANOFILTRATION
MEMBRANE FOR BATIK WASTEWATER TREATMENT

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MASTER OF SCIENCE
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**SYNTHESIS AND CHARACTERIZATION OF POLYETHERSULPHONE
ASYMMETRIC NANOFILTRATION MEMBRANE FOR BATIK
WASTEWATER TREATMENT**

This thesis is dedicated :

To my husband:

Muhammad Shahril bin Shafie,

The wind beneath my wings, true love of my life

To my children,

NURUD SURIA BINTI SUHAIMI

The light of my life, true blessings from God

To my parents,

Suhaimi Hassan and Rasidah Zakaria,

For giving me roots and wings

To my siblings,

Angah, Achik, Enny, Syakin, Yua, Ye and Dayat,

For their powerful inspiration

**Thesis Submitted In Fulfillment of the Requirement for the Degree of Master of
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Abstract of thesis presented to the Senate of University Teknologi Malaysia in fulfillment of the requirement for the degree of Master of Science

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NUKID SURIA BINTI SUHAIMI

This thesis is dedicated :

To my husband;

Muhamad Shukri bin Shafie,

The wind beneath my wings, true love of my life

To my children;

Muhamad Sharif and Najlaa Shakirah,

The lights of my life, true blessings from God

To my parents;

Suhaimi Hassan and Rasidah Zakaria,

For giving me roots and wings

To my siblings;

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For their prayerful inspiration

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NURUD SURIA BINTI SUHAIMI

FEBRUARY 2009

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Faculty : Science and Technology

Batik wastewater contains high concentration of pollutants such as high colour, carcinogenic dyes, and toxic heavy metals, which required extensive treatment before being discharged into environment. This effluent is the one of most difficult to treat due to its synthetic origin and complex molecular structure of dye. The need of an environment with a minimum of pollutant has brought the need of new and useful clean technologies for the industrials production. Removal of colour and dyes from wastewater using conventional techniques are difficult and costly. Due to easy and simple operation required as well as high selectivity achieved, separation using membrane technology has becoming promising alternatives to treat colour wastewater. In this study, locally made asymmetric membranes were prepared from aromatic polyethersulphone (PES) polymer from 19% to 25% of concentration, using *N-Methyl-2-Pyrrolidone* (NMP) and water (H₂O) as solvent and nonsolvent, respectively. The membranes were prepared using dry-wet phase inversion process through different conditions to produce a membrane with an optimum performance to be used in Batik wastewater treatment. The effect of polymer concentration, shear

rate and coagulation bath temperature on membrane performance in removal NaCl and dye were been discussed. The optimum membrane with highest dye removal was tested to evaluate suitable pH conditions, in removal heavy metals and COD. Finally, membrane prepared at 23% of polymer concentration; with casting speed 10 s and immersed in 50°C coagulation bath which formerly known as M23/10(50), was chosen as the best membrane with dye removal is up to 93.5% and permeability coefficient 3.64 l/m².h.bar. This membrane operate better at pH 7.4 with removal of colour and heavy metals such as Mn, Cd and Cu more than 90% and COD removal up to 80%. Morphology characterization of the membrane using Scanning Electron Microscopy (SEM), modeling and MWCO were also been described which are 2700 Da with $r_p=1.36$ nm. Other parameters are $\Delta x/A_k = 0.0089$ μm and $\zeta = -1.41$ which also enhanced high separation of charged solutes. Thus, this study has certainly contributed to the understanding of the effect of preparation conditions to produce an optimum membrane to be used in Batik wastewater treatment.