DEVELOPMENT OF ASYMMETRIC POLYETHERSULFONE ULTRAFILTRATION (PES-UF) MEMBRANE FOR BACTERIA REMOVAL

WONG LING YONG

MASTER OF SCIENCE
UNIVERSITI MALAYSIA TERENGGANU
MALAYSIA

2009

DEVELOPMENT OF ASYMMETRIC POLYETHERSULFONE ULTRAFILTRATION (PES-UF) MEMBRANE FOR BACTERIA REMOVAL

WONG LING YONG

Thesis Submitted in Fulfillment of the Requirement for the Degree of Master of Science in the Faculty of Science and Technology University Malaysia Terengganu

2009

Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu
in fulfillment of the requirement for the degree of Master of Science.

DEVELOPMENT OF ASYMMETRIC POLYETHERSULFONE-ULTRAFILTRATION (PES-UF) MEMBRANE FOR BACTERIA REMOVAL

WONG LING YONG

June 2009

Chairperson : **Associate Professor Nora'aini Binti Ali, Ph.D.**

Member : **Mariam Binti Taib, Ph.D.**

Faculty : **Science and Technology**

Ultrafiltration is a well-known membrane technology based on particle size that can retain macromolecules or high-molecular-weight compounds, as well as colloidal and suspended matter. UF also excludes bacteria and viruses, which allow its application for water disinfection, producing drinkable water as permeate of the process.

In this study, a multi component dope solutions with the range of polymer concentration 13 wt.% to 17 wt.% were prepared using polyethersulfone, 1-methyl-2-pyrrolidinone and water. The PES-UF membranes were prepared using an electrically controlled casting machine based on a dry/wet phase inversion technique. Membrane performances in terms of pure water permeability, salt water permeation, salt water rejection and bacteria removal had been evaluated using low operating pressure (100 kPa to 500 kPa).

In order to improve the performance of the produced membranes, additive (PEG) within the range of 1 wt.% to 9 wt.% had been blended into the dope

solution. For this study, membrane with polymer concentration of 13.60 wt.% had the best performance in terms of flux production and salt water rejection. Experimental data show that it achieved high salt water permeation from 1027.4 L/m^2.h to 4109.6 L/m^2.h and also 99.7% of salt water rejection. In addition, it also demonstrates a total rejection for *E. coli* and *E. faecalis* with flux rate of 320 L/m^2.h and 400 L/m^2, respectively.

Modeling data based on the theoretical model showed that the fabricated PES-UF membranes have thinner skin layer and narrower pore sizes with pore radius 0.78 nm to 1.77 nm. SEM image obtained also showed a fine asymmetrical membranes structures. With good performances and structural properties, PES-UF membranes produced should be able to become a platform to produce locally high performances UF membranes for various applications in the future.