FABRICATION OF CHITOSAN / CELLULOSE ACETATE BLEND MEMBRANE WITH USE MICROWAVE TECHNIQUE

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Introduction

Objective

The aim of this study is to fabricate and evaluate the performance of chitosan / cellulose acetate blend membrane.

Scope

To evaluate the influence of acetic acid concentration in CA/CS blend membranes.

To determine the molecular cut off of the membrane using various molecular weight PEG standard solutions.

To determine the morphology of membrane using SEM and relate it to its performance

Current research-blend membrane

- Blend membranes of cellulose acetate / chitosan has been fabricated. The reason for choosing chitosan is to achieve highly porous and macrovoids free membranes with different pore size.
- The blend hollow fiber membranes have high mechanical strength, tunable hydrophilicity / hydrophobicity and good binding or adsorption capabilities toward heavy metal ions or albumins, even at the presence of a small amount of CS in the blend hollow fiber membranes.

Ref :Chunxiu Liu and Renbi Bai, Preparing highly porous chitosan/cellulose acetate blend hollow fibers as adsorptive membranes: Effect of polymer concentrations and coagulant compositions, journal of membrane science,279 (2006) 336–346

Research Methodology

i. Casting a flat sheet membrane
ii. Use microwave technique in preparation the dope solution
iii. Use mixture acid acetic/water as a solvent in the blend membrane

Materials

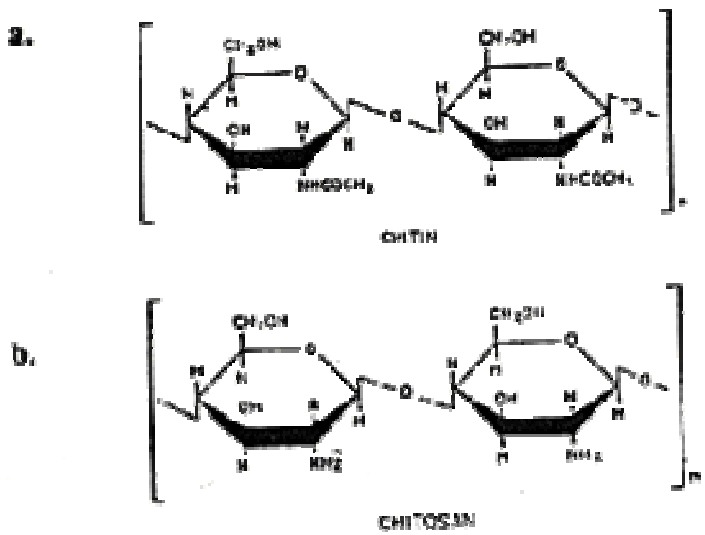
- Chitosan
- Cellulose acetate
- Distilled Water
- Acetic Acid

1. Chitosan

- **Commercial chitosan is derived from the shell of shrimps and other sea crustaceans.**

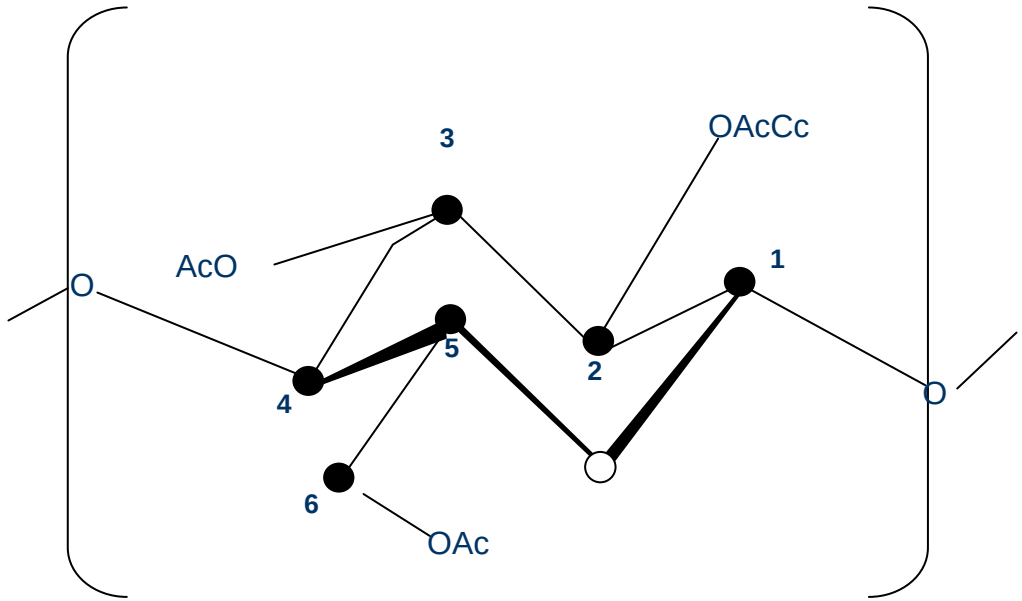
Advantages

Easy availability
Positive charge
Biocompatibility
Antimicrobial activity
Low cost



2. Cellulose Acetate

- It is a synthetic fibers based on cotton or tree pulp cellulose (biopolymer)



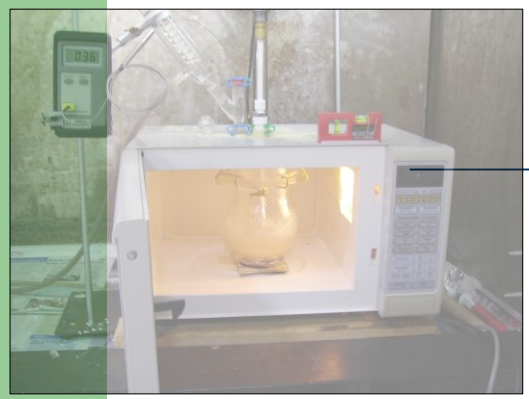
Methodology

1. **Preparation of dope solution**
2. **Casting of the flat sheet membranes**
3. **Testing and analysis of membrane**

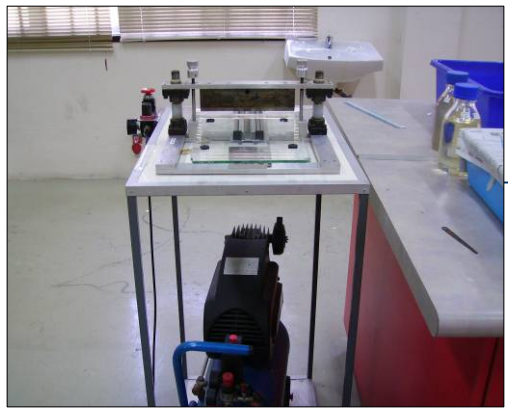
Preparation of dope solution

	Composition on solvent	Composition on Membrane		
Type	Concentaration Solvent (w/w)	Solvent (acidacetic/ water) w/w	Cellulose Acetate	Chitosan
A	Water = 40% Acid Acetic = 60%	80%	19.5%	0.5%
B	Water = 30 % Acid Acetic = 70%	80%	19 5%	0.5%
C	Water = 20 % Acid Acetic = 80%	80%	19.5%	0.5%

Preparation of membrane



Preparation of dope solution



Membrane casting

Stored in wet condition

Membrane Testing

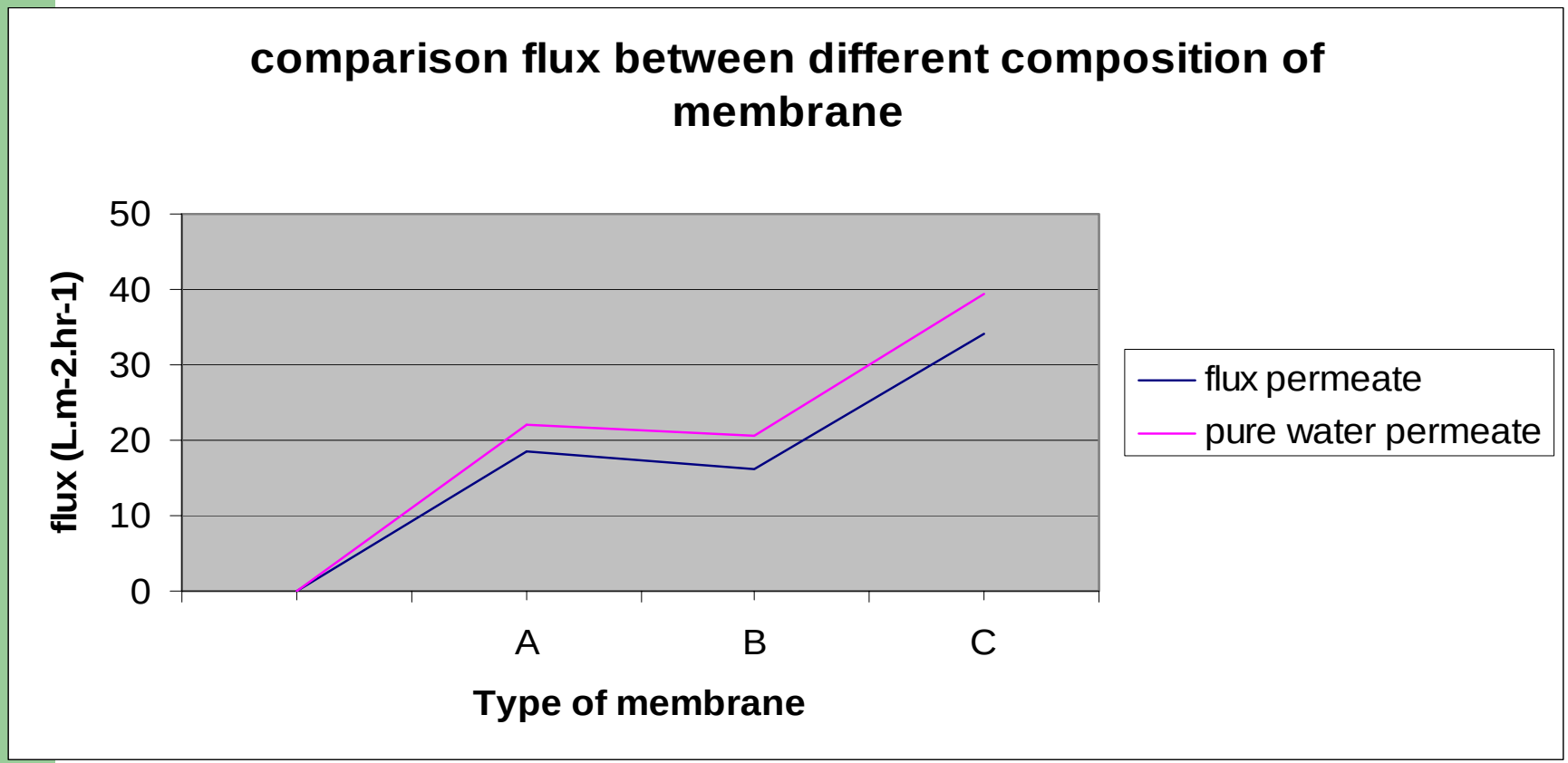
Membrane Testing And Analysis

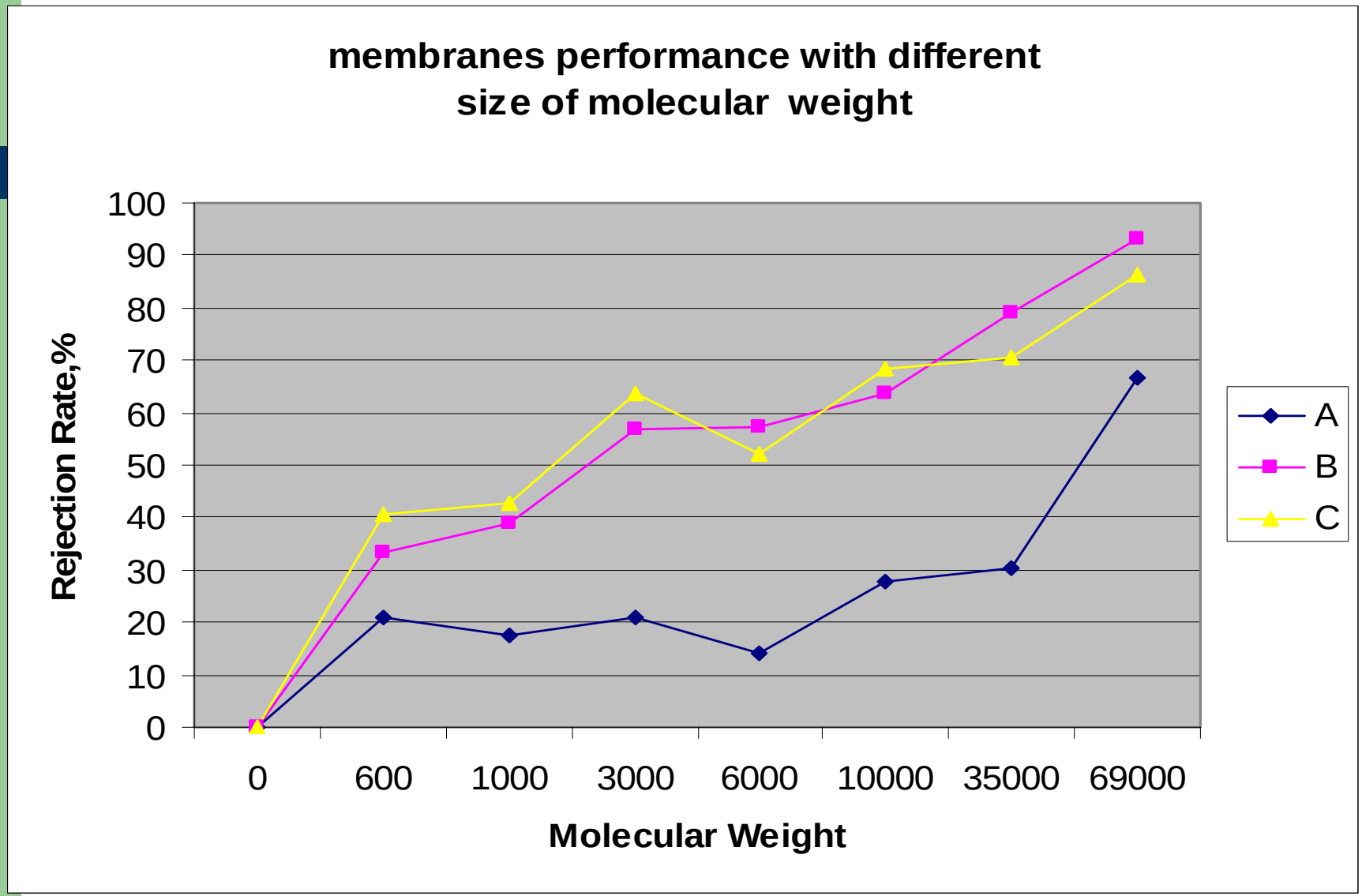
To determine MWCO using PEG solutions of different molecular weight

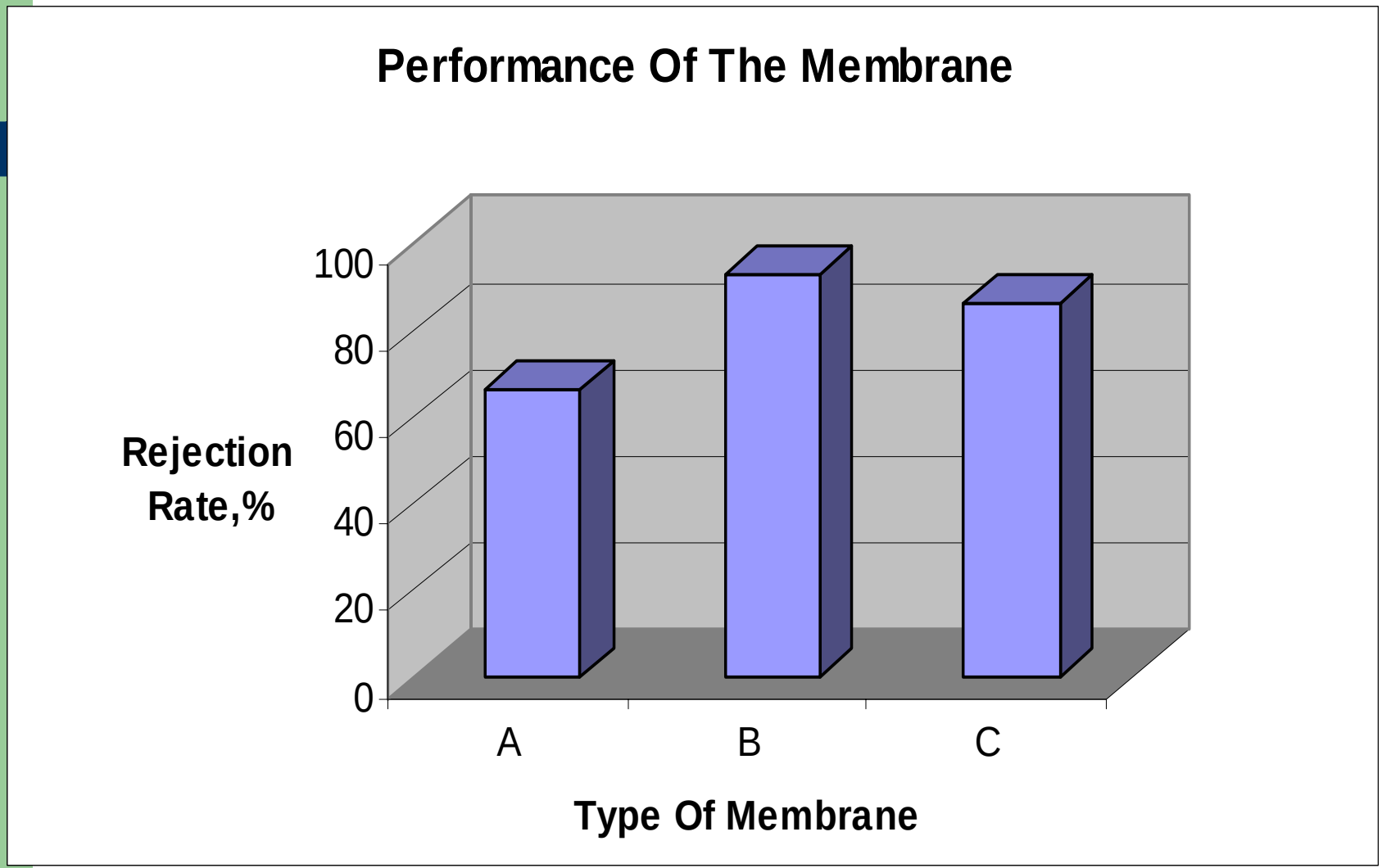
Scanning Electron Microscope

To determine the flux of membrane

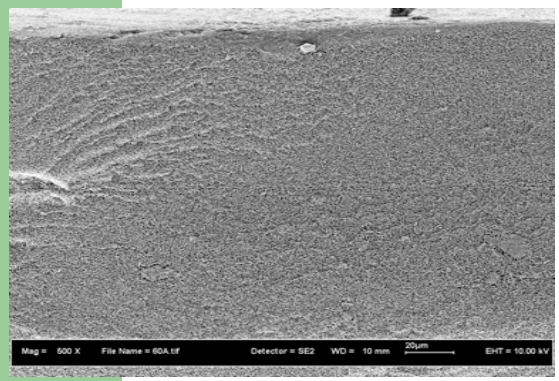
Result And Discussion



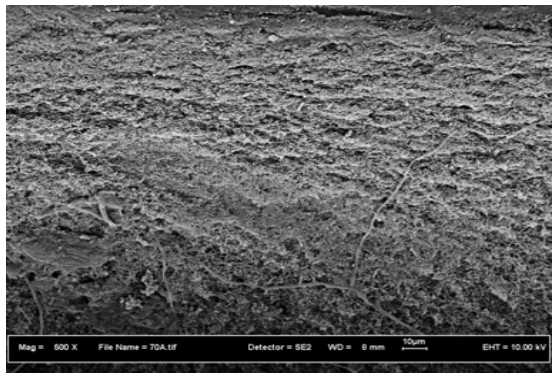

membranes performance with different size of molecular weight
Rejection Rate,%
100
90
80
70
60
50
40
30
20
10
0
0
600
1000
3000
6000
10000
35000
69000
Molecular Weight
A
B
C


Performance Of The Membrane
Rejection Rate,%
100
80
60
40
20
0
A
B
C
Type Of Membrane

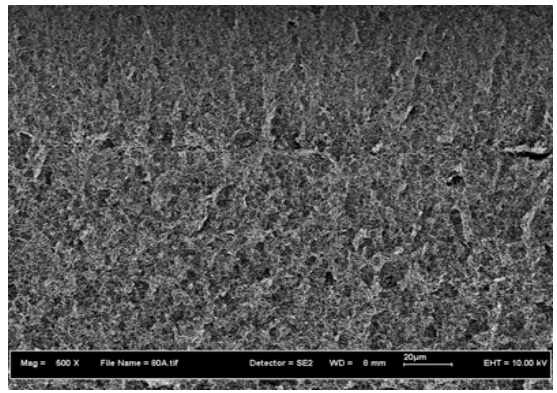
SEM for 500 X magnify



A

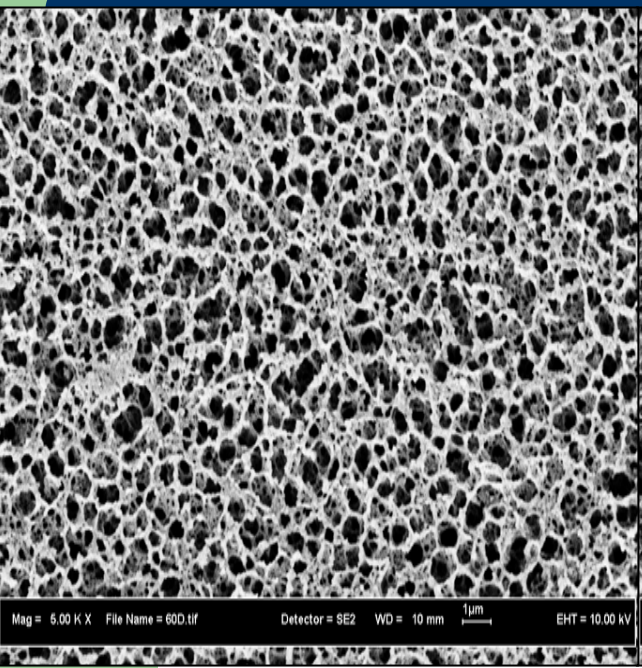


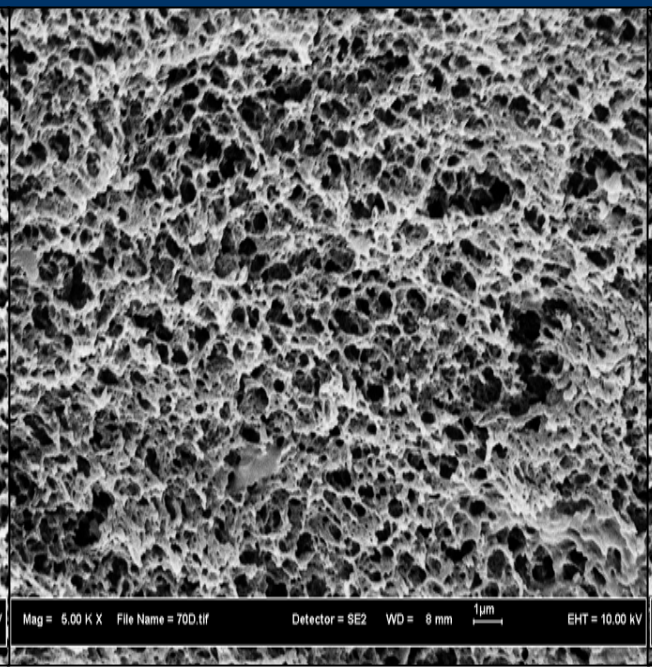
B

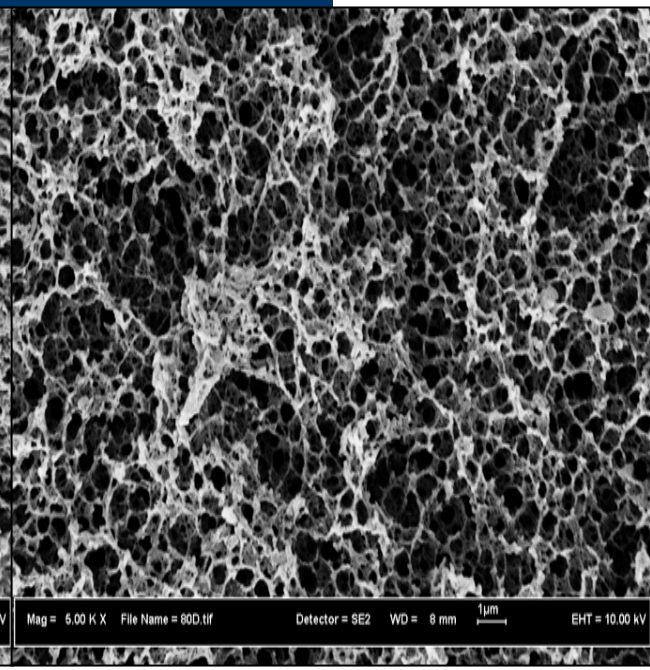


C

SEM 6000X magnify





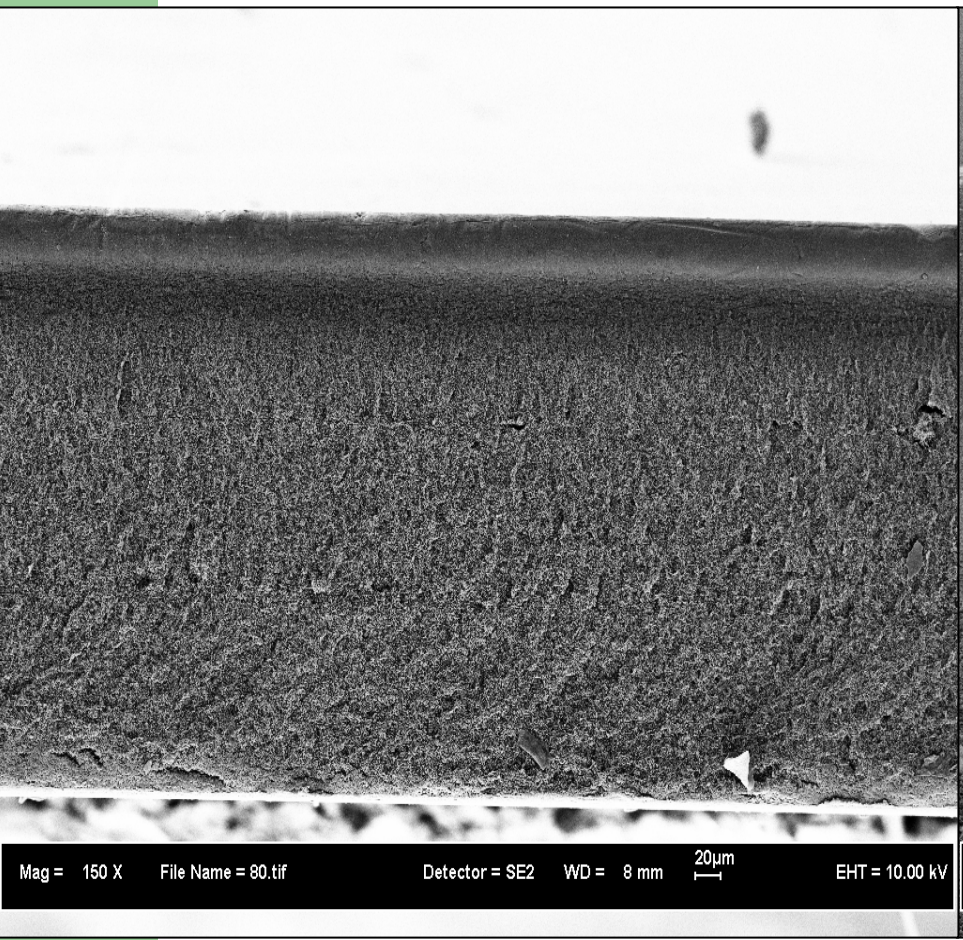


60%

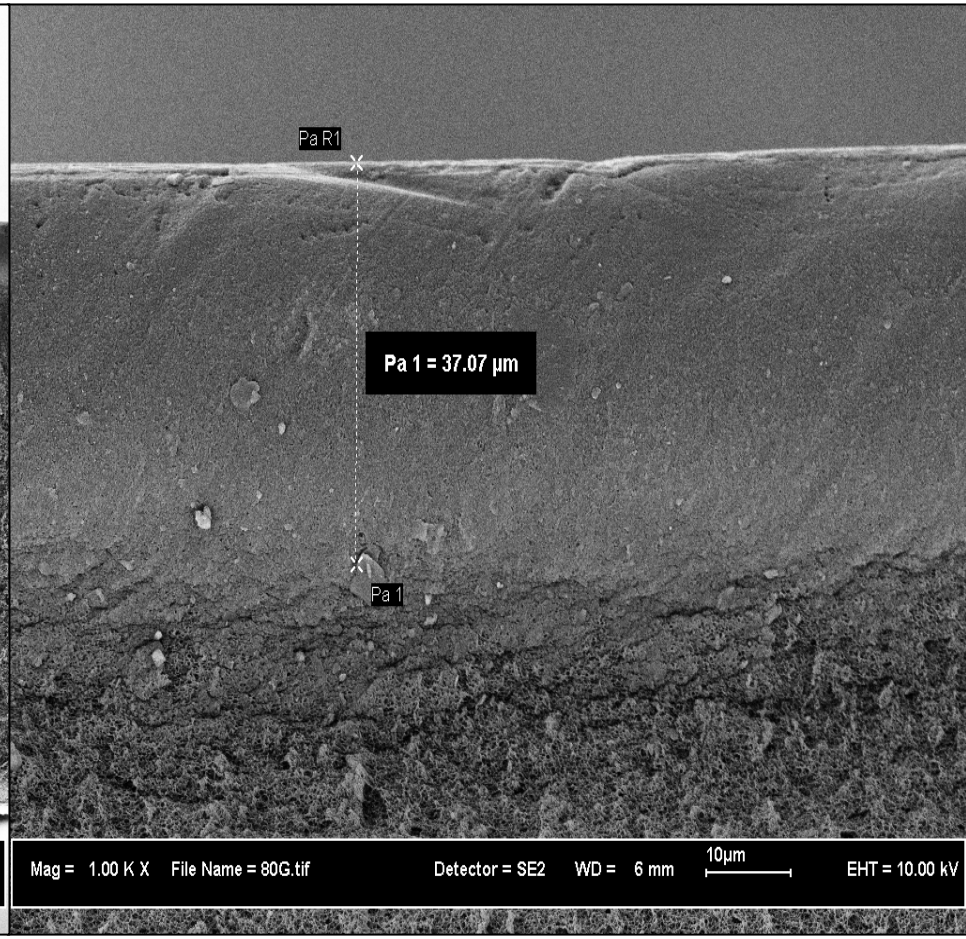
70%

80%

Asymmetric Membrane



500X



1000X

Conclusion

1. Type B of membrane is the best rejection rate of membranes
2. 69 000 is a molecular weight cut off.
3. Type C is the best flux among the membranes (39.53 $L.m^{-2}hr^{-1}$).
4. This membrane have a micro porous.
5. Type of the membrane is a asymmetric membrane.


THANK you
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