

UNIVERSITI TEKNOLOGI MARA

**THE MORPHOLOGICAL AND PERFORMANCE
STUDY OF ALUMINA DISC MEMBRANE**

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ABSTRACT

Ceramic membranes can be used for water separation and gas filtration owing to its chemical inertness, good mechanical and porous properties. In this work, a total of 18 ceramic membranes were fabricated by varying the parameters such as ceramic powder composition (Al_2O_3), solvent (DMSO) concentration in external coagulation bath, and sintering time. The morphologies of the prepared alumina disc membranes prepared were studied using digital microscope. In order to understand the effects of morphologies towards the permeation rate of the ceramic, membranes-dead end water permeation tests and salt rejection tests were carried out to study the performance of the alumina disc membranes. Membrane 1 which was fabricated with 50% alumina loading, 0% DMSO in coagulant and sintering time of 8h was used as reference membrane. It was found that by increasing the alumina up to 65%, the structure become denser and water flux decreased up to 26%, while the salt rejected increased by 55%. Effects of increasing the solvent concentration in external coagulation bath were obvious in finger length which become more short and performed 61% but fluctuate in salt rejection. Sintering time effect was not significant in salt rejection studies as it gives only small difference but increase in water flux because the longer sintering time cause the void presence to the membrane. Different results were showed and proved when varied the parameter. Alumina loading, DMSO concentration and sintering time do have effects on morphology and performance. It is found in this study the most promising and excellent alumina disc membranes was the one with low alumina loading which is 50%, immersed in 60% solvent concentration of DMSO in external coagulation bath and with the longer sintering time that is 12 hours at 1450°C .

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TABLE OF CONTENTS

	PAGES
AUTHOR'S DECLARATION	ii
SUPERVISOR'S CERTIFICATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF EQUATION	x
CHAPTER ONE: INTRODUCTION	1
1.1 Research Background	1
1.2 Problem Statement	1
1.3 Objectives	2
1.4 Scopes of Research	2
CHAPTER TWO: LITERATURE REVIEW	3
2.1 Membrane Technology	3
2.2 Membrane	5
2.2.1 Structure of Membrane	5
2.2.2 Membrane Form and Configuration	6
2.2.3 Materials	8
2.3 Method of Ceramic Membrane Preparation	9
2.3.1 Mechanism	10
CHAPTER THREE: RESEARCH METHODOLOGY	12
3.1 Design of Experiment	12
3.2 Chemicals and Materials	14
3.3 Preparation of Alumina Dope Suspension	14
3.4 Preparation of Alumina Disc Membrane	15

CHAPTER ONE

INTRODUCTION

1.1 RESEARCH BACKGROUND

Membrane is originated from latin word named 'membrana' which means the skin. Membrane can be referred as the material that separate two phase system by its special characteristic of selective barrier hence making it as an alternative way in separation and filtration technology. The historical background in the idea of membrane separation development started from year 1748 where Abbe Nolet introduce the word osmosis in water permeation using diaphragm. The earlier materials that they use in the making of membrane are mainly involved biological membrane. The source is depend on the animal parts such as the bladders of pig, cattle or fish and sausage casings made of animal gut. The researched is continue until around 1900 which then they found a way to synthesized alternative source which is the synthetic nitrocellulose membrane. The development regarding the membrane potential has been researched from then up until now in order to propose and create an invention that may benefits the separation technology as well as mankind(Sh.K & H.M., A., 2016).

1.2 PROBLEM STATEMENT

Membranes have been increasingly applied especially in water treatment sector process as sustainable energy purpose. Besides, the environmental regulation and the demand for clean water as well as from desalinated water kept increasing. Membrane has become important because it provide ease separation system in terms of operation, economical and performance. Hence, the crucial part is depend on the membrane morphology as it act as key features that determine the performance of the membrane. The controls over the formation of micro channel inside ceramic membrane is needed in order to improve the efficiency of the membrane to the maximum level. Therefore, some factor that contribute to the formation of the membrane are investigated and many researches has been carry out to broaden the application in membrane separation technology (Sh.K.Amin et al., 2016).