

**EQUILIBRIUM STUDIES ON ADSORPTION OF BOVINE SERUM ALBUMIN
(BSA) USING PVDF MEMBRANE.**

EDZHARFARIZ BIN TAMIN

**This report is submitted in partial fulfillment of the requirements needed
for the award of Bachelor in Chemical Engineering (Hons)**

**FACULTY OF CHEMICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
SHAH ALAM**

JAN 2018

ACKNOWLEDGMENT

Thousand thanks to my supervisor, Dr. Norhidayah Ideris for all the guides that she gave throughout this research and Universiti Teknologi Mara for giving me opportunity to pursues my study in Chemical Engineering.

ABSTRACT

PVDF Immobilon FL membrane has been acknowledged for potential use as a good material compatibility towards protein adsorption in biosensor application. To characterize the adsorption capability of membrane, equilibrium studies on adsorption isotherm is one of most useful method. In this study, the initial concentration of protein is varied in range 0.5 mg/L, 1.0 mg/L , 1.5 mg/L , 2.0 mg/L and 2.5 mg/L. The linear equilibrium isotherm model used to approximate with the experimental data are Langmuir type-I, Langmuir- type II, Langmuir type III, and Freundlich Isotherm. Preliminary for the experiment, the sample PDVF is been characterized in terms of the hydrophobicity, porosity, and surface polymorph by using water contact angle instrument, wetting liquid and weighting method, and Fourier transformation infrared spectroscopy (FTIR) respectively. The concentration of BSA adsorbed measured at $\lambda = 562$ nm by using UV-v is spectrophotometer.

TABLE OF CONTENTS

	PAGE
DECLARATION	ii
CERTIFICATION	iii
ACKNOWLEDGEMENT	v
ABSTRACT	vi
TABLE OF CONTENTS	vii
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF ABBREVIATIONS	xi
CHAPTER 1	INTRODUCTION
1.1	Research Background 1
1.2	Problem Statement 3
1.3	Objectives of Research 3
1.4	Scopes of Research 4
CHAPTER 2	LITERATURE REVIEW
2.1	Biosensor Kit 5
2.2	Membrane in Biosensor 6
2.2.1	Alumina Based Membrane 7
2.2.2	Cellulose Acetate 7
2.2.3	Polyvinylidene Difluoride 7
2.3	Membrane Characterization
2.3.1	Effect of Adsorption Due to Surface Wettability 9
2.3.2	Effect of Adsorption Due to Surface Morphology 10
2.3.2	Effect on Polymorph conformation 13

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY

Membrane can be classified into biological and synthetic membrane. Biological membrane is exists in all organism from cellulose based in plant and commonly protein based bilayer in animal. Cellular membrane has specific function for organism cellular communication, selective transport permeability, and as protective layer in temperature fluidity response. In 1865, the first synthetic membrane was successfully prepared by Fick from nitrocellulose taking advantages from osmosis phenomenon potential in natural membrane. However, membrane permeation was only a subtopic under material science before membrane technology being recognized in 1970. Since then, the membrane application is blooming in large industrial scale [1].

By the emergence of synthetic membrane, various scope of study has been done throughout the membrane development years. Synthetic membrane preparation could be achieve by using polymeric composition or ceramic composition. Both polymeric and ceramic membrane gives different attribute for desired application of membrane function such as separation, contacting, immobilization and controlled released [2]. Ceramic membrane is composed by inorganic material such as ferric oxide or quartz crystal commonly with Silicon carbide, Aluminium oxide and Titatium oxide layer imbed in support structure of membrane, while cellulose and derivative organic based material were commonly used in polymeric membrane preparation. The fact is ceramic membrane always offer higher setup cost than in polymer membrane application to industry. However, ceramic membrane contribute low maintenance cost and long term usage lifetime with high permeation rate better than in polymer membrane which always need periodic maintenances service [3]. Around 1980, industrial application involving reverse osmosis, microfiltration, ultrafiltration and electro dialysis were all established process [4]. During that time, gas separation of nitrogen from air and carbon dioxide from natural gas was the first pick point before sophisticated growth seen in gas process industry [2].