

UNIVERSITI TEKNOLOGI MARA

**POTENTIAL OF LIPASE IMMOBILIZED
POLYETHERSULFONE (PES) MEMBRANE IN
BIPHASIC
REACTOR FOR OIL HYDROLYSIS**

FATEN AMIRA BINTI HAMIDI

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ABSTRACT

Many green campaigns have initiated and spreading tons of awareness of the “greener Earth” by implementing more environmental-friendly methods and techniques in order to combat the current pollutions as well as employ the highest efficiency with an affordable cost. This study aimed to enhance the filtration process by incorporating enzyme to the membrane support system. In this study, an enzymatic membrane was applied to investigate the use of enzyme from bacteria origin that was able to enhance the separation of oil-water interfaces and as well as the effectiveness of the enzyme immobilization membrane. Lipase from *Aspergillus niger* origin is used to be immobilized onto the Polyethersulfone membrane. A membrane reactor with biphasic system was configured at laboratory scale in order to possess an organic-aqueous system with lipase immobilized membrane. The performance of the reactor was investigated with the olive oil hydrolysis in order to study the effect of the operating variables. The results found that the degree of hydrolysis (%) was the highest at 6-hour and with initial lipase concentration of 3 mg/ml which resulted in 0.11 mg/cm² amount of lipase immobilized.

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CHAPTER ONE

INTRODUCTION

1.1 Research Background

The fast-ever growing oil industry up until this century has arisen many concerns especially the effects towards the environment in various degrees. Hydrocarbons pollution is a very serious issue in the environment and represents 70% of environmental pollutions. Some of the bad impacts are human cancers; increment of lead concentration in soil which is especially will bring harms for young children that can cause developmental damage to the brain and many more. For instance, the oil spills from various accidents includes pipelines and flow lines leakage/blowouts, blowouts from wellheads due to poor maintenance and damage, and spills from flow stations have brought many negative effects towards not only marine life, but also our water sources such as the oceans, lakes, rivers and etc.

There are many methods and new technologies that have been developed and still in research and development (R&D) stage towards finding the most economical, effective and efficient solutions to this problem. However, most of the methods found can be very effective at decreasing wide range of contaminants but at the same time have some consequences. These methods are complex, not economical and lack of public acceptance. The associated lacks in these methods have focused efforts towards harnessing microbial enzyme as a suitable alternative.

This is the reason why the researchers have taken an alternative to go deeper into the refinement of biological treatment since there are potential affordable alternatives. A lot of studies have proven that great number of enzymes from bacteria; fungi and plants have been stated to be involved in the biodegradation of toxic organic pollutants.