

UNIVERSITI TEKNOLOGI MARA

**PRETREATMENT OF WATER-
SOAKED OIL PALM FROND BY
ELECTRON BEAM IRRADIATION
AND IONIC LIQUID**

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ABSTRACT

Pretreatment of lignocellulosic biomass is needed in order to treat the raw material more effectively. Pretreatment method is classified into 4 groups; physicochemical, chemical, biological and physical method. In this research project, the physicochemical and chemical method were chosen. For the physicochemical method, electron beam irradiation was conducted while for the chemical method, ionic liquid pretreatment will be used. Previously, the dissolution of lignocellulosic biomass only by using ionic liquid was investigated. By combining the ionic liquid and the electron beam irradiation, the performance of both methods were observed. The main objective of this project is to investigate the composition of lignin, cellulose and hemicellulose in the water-soaked lignocellulosic biomass by using ionic liquid with and without the electron beam irradiation. For the determination of lignin, the method used was by the calibration of Kappa number method and Klason method. For the cellulose and hemicellulose, Tappi method T-203 was used.

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CHAPTER ONE

INTRODUCTION

1.1 Short Summary

Pretreatment of lignocellulosic biomass is needed in order to treat the raw material more effectively. Pretreatment method is classified into 4 groups; physicochemical, chemical, biological and physical method. In this research project, the physicochemical and chemical method were chosen. For the physicochemical method, electron beam irradiation was conducted while for the chemical method, ionic liquid pretreatment was used. Previously, the dissolution of lignocellulosic biomass only by using ionic liquid was investigated. By combining the ionic liquid and the electron beam irradiation, the performance of both methods can be observed. The main objective of this project is to investigate the composition of lignin, cellulose and hemicellulose in the water-soaked lignocellulosic biomass by using ionic liquid with and without the electron beam irradiation. For the determination of lignin, the method used was by the calibration of Kappa number method and Klason method. For the cellulose and hemicellulose, Tappi method T-203 was used.

1.2 Research Background

Lignocellulosic biomass (LCB) offers many advantages as one of the agro residue. It is a renewable biomass which is in abundance and cheap stock. The LCB needs to break down its structure due to the rigid body. LCB is composed of the plant cell wall, with structural carbohydrates cellulose, hemicellulose and lignin. The LCB is Oil Palm Frond (OPF) was used in this project. The LCB undergoes pretreatment for the investigation of lignin, hemicellulose and cellulose composition. Pretreatment method can be considered as one of the expensive method and there are many types of the pretreatment method such as biological, chemical, physical and physicochemical methods.

Ionic liquid pretreatment is one of the example of the pretreatment methods. Presence of ionic liquid bio-ionic media with the optimized condition is needed in order to investigate the dissolution rate of lignin. Ionic liquid has many advantages as it has the good potential to dissolve lignocellulosic materials including the crystalline cellulose. Ionic liquid is also known