UNIVERSITI TEKNOLOGI MARA

CHARACTERIZATION OF CELLULOSE FROM MICROWAVE EXTRACTED MESOCARP FIBRE

NUR ILLYA AQINNAH ZULKEFLI

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ABSTRACT

This study was focused to determine and compare the cellulose, hemicellulose, lignin and extractive content of microwave assisted oil palm mesocarp fibre (OPMF). The sample preparation of the oil palm mesocarp fiber was divided into two parts which is microwave assisted sterilization and cum extraction. The chemical analysis will be used to characterize the cellulose will follow the TAPPI standard method. The highest cellulose content obtained is for OPMF is where power level of microwave used is 600 W with irradiation time for 6 minutes while the optimum power level that produced the highest cellulose content of 67.43% at constant power 300W is for 25 minutes. Hemicellulose content was reduced in the range of 30% to 40% compared to the untreated oil palm mesocarp fibre, which is 41.29%. The optimum pretreatment condition for microwave-assisted sterilization in removing optimum lignin content is at 400W for 30 minutes. Higher lignin content is not desirable as lignin acts as a barrier for any solutions by involving both hemicelluloses and cellulose. Only small amount of extractive content reduced in the range of 3% to 4%. The highest extractive content is reduced from 4.45% to 3.45% with 1:0.5 fruit to water is at 800W for 6 minutes. Higher amount of extractive also contributes to poor quality in chemical and mechanical pulping. Removal of extractive is effective with optimum temperature 300W microwave power and prolong irradiation time.

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CHAPTER ONE

INTRODUCTION

1.1 Research Background

Cellulose can be considered as one of the most plentiful natural polymers can be found on the earth. It has a great deal of special properties such as biocompatibility, sustainability and biological degradability (Zhao *et al.*, 2013). Other than having the biodegradable characteristics as advantage, cellulose fibrils in nanoscales sized which created from biomass is proven to be qualified as one of the new strengthening agent for polymer composites which can lead to producing possible lightweight and strengthens the composite (Cheng *et al.*, 2009).

These renewable natures are imitative biodegradable materials and environmental friendly have made them as the best candidates for sustainable technologies development. It is generally used in commercial materials due to its astounding properties such as biocompatibility, biodegradability, thermal and chemical stability (Maheswari *et al.*, 2012).

As the background, there are many advantages of using cellulose as the basis of any component in bio-product such as high profusion, low cost and the virtual ease of its chemical modification. Example of the application of the cellulose bioproduct is paper products as the cellulose is the main component that make up anything that is from papers such as cardboards and paperboards. Besides that, the usage of cellulose as the substitution of petroleum has started gaining attention recently.

Oil palm agriculture is a standout amongst the most cost-effective and great potential enduring oil crops. Malaysia can be considered as one of the major industrial agricultural of oil palm amongst the Southeast Asian regions. Oil palm empty fruit bunch (OPEFB) fiber and oil palm mesocarp fibre are two essential types of leftovers during the processing of palm oil, which is called palm oil biomass. Extensive research is required on the chemical and physical properties of the fibers in order to fully utilize the cellulose fibers which can bring the best outcome that beneficial to the public besides saving energy and cost.