THERMAL CHARACTERIZATION OF LIGNIN FROM EXTRACTION OF LEUCAENA LEUCOCEPHALA PODS BY FORMIC ACID FRACTIONATION PROCESS

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ABSTRACT

Lignocellulose is one of the most abundant renewable sources of carbon that has been used for production of biofuel, chemical and polymers. Lignin is comprises of phenylpropane units linked together by various types of interunit linkages of which ether bonds are the widely recognized, represents 10–25 wt% in the lignocellulosic biomass and it is a key compound in the present and future biorefinery, rendering its valorization of great importance. This study investigated the highest yield amount of lignin with different aging of Leucaena Leucocephala Pods based on the length of their seeds and analyse the thermal characteristic of lignin properties from different aging of Leucaena Leucocephala Pods by using Thermogravimetric analysis (TGA). Fractionation process was used to extract the lignin with different aging of Leucaena Leucocephala Pods based on the length of their seeds was using a mixture of formic acid and hydrochloric acid as a catalyst by dissolving the samples with solution to retrieve the lignin. Lignin can obtain from black liquor after filtration process to separate the lignin from the solubilized hemicellulose. It was found that lignin obtained from sample 7mm length of seed provided the greatest yield of the various length size of raw materials. The length of LL pods was seen to affect the thermal properties. Overall, the lignin from sample 7mm had the highest yield lignin amount and greatest thermal stability.

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CHAPTER 1

INTRODUCTION

1.1 Research Background

Lignocellulosic biomass has been acknowledged for potential use to produce chemicals and biomaterials and it is the most important renewable source of materials. The main components in the lignocellulosic are cellulose, hemicellulose and lignin. Lignin is the second most abundant natural polymer after cellulose that is making up to 10-25% of lignocellulosic biomass (Watkins et al., 2015). Lignin is a class of complex natural polymers that form important structural materials in the help tissues of vascular plants and some algae. Lignins are especially imperative in the development of cell walls, particularly in wood and bark, since they loan unbending nature and don't decay effortlessly. According to Tan et al. (2009), the presence of lignin within lignocellulose is also a major barrier to enzymatic hydrolysis of cellulose by cellulases, as well as inhibiting fermentation to form products such as ethanol. Hence its presence diminishes the value of lignocellulosic materials where the carbohydrate component provides the chemical feedstock for conversion to biofuels and commodity chemicals.

Leucaena leucocephala (LL), once in the past known as L. glauca, is a thornless extensive bush or tree which may develop to statures of 7-18 m. Leaves are bipinnate with 6-8 sets of pinnae bearing 11-23 sets of handouts 8-16 mm long and the inflorescence is a cream shaded globular shape which conveys a group of level darker units 13-18 mm long containing 15-30 seeds (Shelton et al., 1994). LL is from family Mimosaceae and at least 14 other species recognised in the genus, for example, in