Lignocellulosic Conversion of Oil Palm Frond for Bio-ethanol

ABSTRACT

Alternatives for energy resources such as petroleum are highly in demand nowadays. One of the more appealing substitutes for fossil fuels are ethanol, which is produced through the fermentation of sugars that could be fragmented from lignocellulosic materials of any plants. Being one of the biggest producers of palm oil in the world, Malaysia are a natural candidate to provide alternative fuels from the conversion of palm oil agricultural waste to bio-ethanol. As for this study, the waste material from the palm oil industry, which is the oil palm frond (OPF), were converted into ethanol via fragmentation and fermentation. Through a sequential two-stage pre-treatment process, the mechanically pulverized lignocellulosic materials underwent two different chemical pre-treatments which includes an alkaline and acidic hydrolysis to break the fragmented cellulose into glucose. The glucose is the final form of monosaccharide that can readily be converted to alcohol via fermentation using Saccharomyces cerevisiae or yeast. The presence of alcohol was determined via infrared absorption frequency using the Fourier Transform Infrared (FTIR) Spectroscopy to identify the functional group, meanwhile the alcohol yield were determined through the specific gravity of the solution. The result shows that the fragmented fermentation process successfully produces alcohol through the analysis of the infrared absorption frequency via FTIR which indicates the presence of peak at 3200 – 3600 cm-1 , confirming the presence of alcohol. The specific gravity of the samples determined the alcohol by volume percentage of 6.9%, indicating the agricultural residue OPF as a viable renewable resource for the production of the equally renewable fossil fuel alternative, which is bio-ethanol.