

**TO STUDY THE PRE-TREATMENT EFFECT ON
THERMAL DEGRADATION OF SHREDDED OIL
PALM EMPTY FRUIT BUNCHES BY
THERMOGRAVIMETRIC ANALYSIS**

NUR FATIHAH BINTI HARUN

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**FACULTY OF CHEMICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
SHAH ALAM**

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ABSTRACT

Currently, there is abundance of waste from oil palm production which can be converted into valuable product and it is most effective and efficient solutions for sustainable energy supply correspond to the increasing of energy demand and also to reduce environmental pollution. Increasing in production of oil palm contribute to the increasing of biomass such as empty fruit bunch (EFB), palm kernel shell (PKS), and oil palm trunk. But then, some researchers found that the biomass has its own problem which is high moisture content, low density and low calorific value compared to fossil fuels to substitute as an alternative energy source. In this study, EFB is used and the pre-treatment is carried out at the earlier stage in order to determine the thermal decomposition of the sample. Initially, the sample was immersed using different method of pre-treatment which is conventional treatment and organosolv treatment. In order to study the decomposition temperature, thermogravimetric analysis (TGA) was used with heating rate of 20°C/min and the initial temperature is 30°C and the final temperature is 900°C. In this experiment, 100 ml/min of nitrogen flow was used. During the process, the content in the EFB (hemicellulose, cellulose and lignin) affects the physical properties, texture and thermal reactivity. Based on the results, decomposition of EFB consist of three phase where drying period which water are liberated occur at temperature below 200°C, decomposition of hemicellulose and cellulose during devolatilization occur at the range temperature of 200°C to 500°C, in which at this phase there is a significant drop of in weight loss of sample due to evaporation of volatile hydrocarbon, and lastly followed by steady decomposition of heavy component occur at temperature above 500°C. This study reveal that the pre-treatment by using distilled water is a good pre-treatment because the decomposition of sample is faster compared to others pre-treatment where it shows a high peak on TGA graph.

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CHAPTER 1

INTRODUCTION

1.1 Research Background

Fossil fuels are concentrated organic compounds, mainly known as concentrated biomass and found in the earth's crust which created from decayed of animals and plants. All those organic materials are converted to coal, crude oil and natural gas when it is exposed to pressure and heat in the earth's crust and take time over hundreds of million years. In fact, the oil deposits predicted will be gone by the year 2052 because it need a longer time to get fossil fuels, meanwhile, the rate of consumption are increased year by year where over 11 billion tonnes of oil in fossil fuels was consumed every year and crude oil are vanishing at rate of 4 billion tonnes per year. Unfortunately, a depletion of fossil fuels will occurred and it will run out earlier than expected as the world's population increases and also the demands on fossil fuels too (Tathagat *et al*, 2015).

Since there is a limited supply and to reduce dependence on fossil fuels, some researchers find other alternative energy source in order to substitute conventional fossil fuels. In the same time, they find out the biomass are rank as the third energy source after coal and oil and it is widely recognized as a clean and renewable energy source because energy conversion system based on biomass can reduce the potential of carbon dioxide emissions from atmosphere (Pereira *et al*, 2012). Other than that, it also helps to reduce greenhouse gases that can cause climate change (Shariff *et al*, 2014). In fact, Malaysia is the second largest country that produce and export of oil palm products in the world and automatically it generate a large amount of solid