Biopetrol Production from Acids in Palm Oil Waste

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ABSTRACT

Biopetrol is the alternative fuel derived from vegetable oil which has similar properties with petrol. The increasing petrol price, the decrease of petrol supply and the biodiesel production from vegetable oils are the reasons why biopetrol should be produced for petrol-used vehicles. The studies on the producing of biopetrol from acids in palm oil waste will be carried out to expand the usefulness of the oil palm waste. Acids consists 55% to 65% of the crude palm oil component. In this experiment, palmitic and oleic acids, those presenting in palm oil waste will be used as research materials. All acids in palm oil waste are fatty acids, the subset of carboxylic acids. There are two processes to be undergone: In converting the acids into isooctane, the main component of petrol and biopetrol, heating and distilling acids at isooctane's boiling point through batch thermal cracking process in laboratory scale. The resulted organic liquid then will be analyzed and compared with the properties of isooctane by using gas chromatography (GC) analysis. Gas chromatography results showed that C_8H_{18} presents in the mixture of the heated liquid. These findings proved that oil palm waste can be converted into biopetrol, and biopetrol can be produced to overcome the problem of supplying petrol to petrol-used vehicles.

Keywords: Biopetrol, alternative fuel, fatty acid, oil palm waste, gas chromatography

INTRODUCTION

Gasoline or petrol we are using today is a complex mixture of hydrocarbons. Most of these are alkane with 4 to 10 carbon atoms per molecule. However, isooctane is assigned an octane number of 100. It is a highly branched compound that burns smoothly, with little knock. Thus, it is the highest quality of petrol. Generally, biofuel is defined as fuel produced from derivation of vegetable oils and specifically, biopetrol is defined as fuel which has the same characteristic with the petrol, but is produced from oil palm waste where the conversion of oil palm waste is done to get the molecular formula and structure of isooctane.

The main objective of this research is to produce biopetrol from acids in oil palm waste, which is dominated by palmitic acid as shown in Figure 1 and followed by oleic acid as shown in Figure 2.

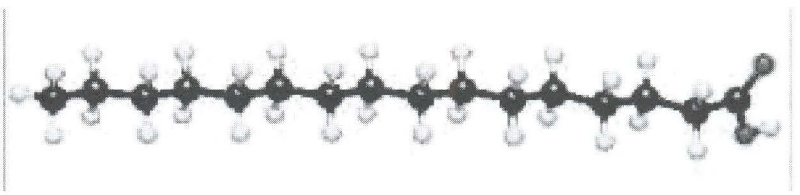

Figure 1: Palmitic acid

The price of fossil fuels nowadays is increasing drastically that caused many other expenses to increase. Additionally, the dependencies on foreign countries can create negative impact on economy. In Malaysia only, for example starting 1st March 2006, the retail price of petrol increased from RM 1.62 per litre to RM 1.92 per litre. Although the Liquid petroleum Gas (LPG) for cooking gas now is used by cabs and several types of latest generation vehicles as alternative of petrol, it is still a petroleum-based product

and its price will also increase as well. With the price of fossil oil increasing each year, because of the decreasing supply, it might be wise for Malaysia to adopt and implement the use of renewable fuel resources. In this case, Malaysia exploits further utilization of its crude palm oil in automotive sector through research and development by authorities related with palm oil industry. The result are the engine oil and biodiesel. Today, the biodiesel production from palm oil in Malaysia has been established, industrialized in big scale and commercialized to Europe [19, 23]. However, the biodiesel used is limited for diesel-used vehicles only, so the same approach must be done for petrol-used vehicles. Thus, biopetrol is hopefully can be a solution of this problem.

Figure 2: Oleic acid

However, the challenge of starting producing biopetrol is that this research is going to be the first approach of using cracking method in laboratory. So it might have certain unexpected problems involving the temperature, the heating energy provided whether it is sufficient to get the temperature needed for obtaining biopetrol. Additionally, the research will outstand at times when the palm oil price are going down, productions are going up, and the energy prices are running high. In this research, the concern is to detect whether the component of isooctane exist in palmitic and oleic acids It is not how much of biopetrol can be produced but to see whether oil palm waste has the potential to produce biopetrol and whether there is an opportunity to optimize its production.

The use of vegetable or animal oils and fats as fuels may be somewhat surprising at first. When examined in an historical context we can see that the compression ignition engine, which was first developed to a usable level of functionality by the French-born Rudolf Diesel near the end of the 19th century, was originally designed to operate on vegetable oil. In 1900, Rudolf Diesel demonstrated his new compression ignition engine at the World Exhibition in Paris running on peanut oil [17]. This has lead to many research on fuel from plant basis such as biodiesel and now research are also been very enliven on producing biopetrol from plant basis. Countries like US and UK are using soybean, canola and sunflower plants to produce biofuel. Malaysia also does not neglect the opportunity in this phenomenon. Malaysia has developed biodiesel from the biggest plantation: palm oil and now is working on setting up three plants to produce biodiesel in large scale [2, 19].

Biopetrol from palm oil is biodegradable and non-toxic since from the environmental point of view, fuel from vegetable sources is environmentally friendly. It is able to suppress certain pollutants that come up from the exhaust, with the exception of NOx in certain cases, where unpredictable results occurred. From the technical point of view it can be said that biofuel (biopetrol) is technically compatible with the current internal combustion engine. Slight modification might be required to enhance the power. Biopetrol could be an answer to the future air emission control. The application of existing biodiesel from palm oil in motor vehicle has been proven to be successful [6].

The fast diminishing energy reserves, greater environmental awareness and increasing energy consumption have led to an intensified search for viable alternative sources of energy globally [21]. In recent years, a great deal of attention has been directed to plant-based sources of fuels.

Since the success of producing biodiesel from palm oil, Malaysia seeks the alternative new energy sources to reduce the dependence of the fossil fuel. It is actually proven that palm oil has achieved its success on producing biodiesel that is now slowly taking the part of automobile fuel along with the petrol itself [19]. Palm oil is considered to be a possible alternative to petroleum. It was noted that 2 billion