MAIZATUL SOFIA BINTI MUHAMAD JIHADI
(2020827402)

TITLE:

PRODUCTION OF FATTY ACID METHYL ESTER USING POTASSIUM METAL SUPPORTED ON OIL PALM KERNEL SHELL ACTIVATED CARBON

SUPERVISOR:

MISS NORKAMRUZITA BINTI SAADON

CHEMICAL ENGINEERING STUDIES
COLLEGE OF ENGINEERING

2023

ABSTRACT

One of the major's by-product of the production of palm oil is palm kernel shells. Waste palm kernel shells can be utilised as a catalyst to produce biodiesel. In addition to having numerous natural elements, the cost of the catalyst made from these materials is also reasonably low when compared to other catalysts, making the manufacturing of biodiesel more economically friendly and sustainable. The process that involved during production of the fatty acid methyl ester is transesterification process. To make vegetable oils less viscous and better suited for use as fuel, transesterification methods have been extensively used. However, a number of parameters, such as the alcohol to catalyst molar ratio, the presence of water, the amount of free fatty acids in the oil samples, the reaction temperature, the reaction time, and the agitation rate all have a significant impact on the transesterification reaction. This research is aim to study the reaction temperature in the production of fatty acid methyl ester. The procedure that imply to produce fatty acid methyl ester consists of five steps which is preliminary clearing process, preparation of activated carbon, preparation of catalyst, transesterification process and analysis sample. The reaction temperature that used is 50 °C, 55 °C and 60 °C. The percentage yield of fatty acid methyl ester of 20 wt.% active metal catalyst will be observed to compared a better yield at three different reaction temperature.

TABLE OF CONTENTS

CHAPTER ONE
BACKGROUND

1.1 Introduction

Due to the depletion of fossil fuels, rising energy consumption, and environmental degradation, there has been a lot of interest in the creation of renewable fuels for these recent years. Fatty acid methyl esters, often known as biodiesel or FAME, is one such fuel that has advantages over petroleum-based fuels, such as biodegradability, reduced hazardous emissions, a high flash point and cetane number. Because of its good miscibility with petro diesel, it can be mixed in various ratios with the substance. (Amenaghawon 2022). The expense of the production method is the main obstacle to large-scale biodiesel production. Up to 80% of the real cost of producing biodiesel is attributable to the cost of the feedstock. The high production cost of biodiesel needs to be decreased in order for it to be competitive in the worldwide energy market. The hunt for less expensive and more accessible feedstocks has been prompted by this, with the majority of emphasis now being paid to low-cost non-edible oils. (Amenaghawon 2022).

The usage of palm kernel shell has been extensively caught attention globally in the production of biodiesel. The oil palm kernel shell (OPKS) is a waste product from the manufacturing of palm oil and it can be used as an activated carbon for its cheaper price and natural ingredients. According to Astuti (2018), the cellulose (26.27%), hemicellulose (12.61%), and lignin (42.96%) content of palm oil shells gives them a higher density than wood, coming in at 1.4 g/ml. The denser the source material, the better the activated charcoal will absorb it, making it suitable for usage as activated charcoal. Pore volume, which is distributed throughout the surface of activated charcoal, has a surface area of active charcoal. The catalyst that been used in this research is heterogenous catalyst as it can be easily recovered and reused for several cycles of catalytic reaction, hence potentially bringing down the cost of the biodiesel.

Transesterification of fats and oils is a typical method of producing biodiesel. This process produces fatty acid alkyl esters (biodiesel) and glycerol as a by-product when the triglyceride in the oil or fat feedstock reacts with an alcohol in the presence of a suitable catalyst. (Amenaghawon 2022). According to the overall equation illustrated in Figure 1.1, 1 mole of 9 triglyceride is reacted with 3 moles of alcohol to form 3 moles of FAME as main product and 1 mole of glycerol as by-product. Excess alcohol is added to shift the equilibrium towards the production of more biodiesel. The transesterification process are influences by four factors such as reaction time, reaction temperature, molar mass oil to alcohol and effect of water and FFA content. For this study, the transesterification process can happen at various temperature depending on the oil that used in the process. The process can be varied not only at higher temperature but also can happen at low temperature depending on the characteristics of the oils.

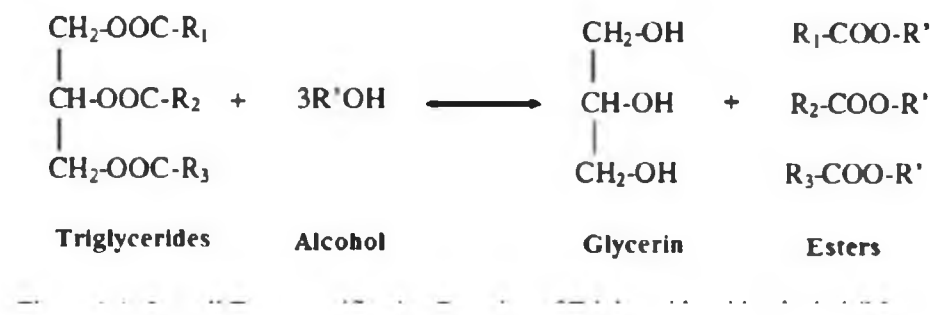

Figure 1.1; the equation of the production fatty acid methyl ester (FAME)