TITLE:

THE EFFECTS OF POTTASIUM CONCENTRATION ON THE PERCENTAGE YIELD OF FATTY ACID METHYL ESTER FROM WASTE COOKING OIL.

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ABSTRACT

Biodiesel (FAME) is a lot of oxygenated than conventional mineral diesel, burning more efficiently in the engine, thus outcome in less emission of hydrocarbons, carbon dioxide, and particulates. Waste cooking oil was trans esterified with methanol in the presence of the heterogeneous base catalyst potassium (K), using carbonized OPF as the catalytic support. The main objective was to determine the effects of potassium concentration on the percentage of fatty acid methyl ester yield from waste cooking oil. The KOH solution was doped with OPF and calcined the mixture at 500 °C, for 4 hours and cold to room temperature for making it a heterogeneous catalyst. To generate FAME during the trans-esterification process, WCO is required to be heated at a higher temperature to eliminate the water content. It was also crucial to have the right ratio of methanol to oil and catalyst to oil. The yield % of FAME was determined using FAME analysis using GCMS. The transesterification of WCO produced the best result of FAME production using 2.0M of concentration of KOH in catalyst with constant weight percent at 10wt%. The concentration at 2.0M produced the best and higher FAME production. This gives positive effects toward the production of FAME in a higher ratio of catalyst and higher concentration used for catalyst.

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CHAPTER ONE
BACKGROUND

1.1 Introduction

In many years, biodiesel (Fatty acid methyl ester) become more economical and widely used for diesel engines because of the characteristics of the organic raw materials (Mizik & Gyarmati, 2021a). It is environmentally friendly, regenerative, non-toxic, and biodegradable. (Thangaraj et al., 2019). according to Rizwanul Fattah et al., (2020) there are various feedstocks for biodiesel production for example plant oils, animal fats, vegetable oil, or other lipids. Furthermore, Biodiesel can lessen the negative effects of diesel emission state and can replace fossil-based diesel. (Rizwanul Fattah et al., 2020). However, according to Ramos et al., (2019) Due to perfect miscibility, biodiesel can be used either in pure form or as a blend with petroleum fuel.

Generally, The most widely utilized commercial technique for producing biodiesel has been transesterification, which has shown to be effective for a variety of feedstocks.al (Akubude et al., 2019). Due to faster kinetics and economic viability, a homogeneous, alkali-catalyzed transesterification process is typically utilized in industry. (Athar et al., 2020). Compared to the homogeneous catalyst, heterogeneous systems are convenient for the separation and recyclability of the catalysts (Liu & Corma, 2018).

According to Guo & Jiang, (2020), One of the most significant transformation technologies in the chemical industry is the heterogeneous catalyst. Naturally, a lot of research has been done on inorganic and polymeric matrix materials for loading catalysts to immobilize surfaces. This is because Sudarsanam et al., (2018) state that homogeneity is often associated with high toxicity, corrosivity, energy-intensive separation and purification procedures, and inefficient reusability. However, the support to mix the metal catalyst with Oil Palm Fronds (OPF) to produce a better catalyst. Based on Kongto et al., (2022) research, Regarding quantity and regularity of availability, Oil Palm Fronds have a significant potential for producing biofuels and bioenergy.

1.2 Literature Review

1.2.1 Biodiesel (fatty acid methyl ester) production

Biodiesel is a blend of alkyl esters made from fatty acids that can replace fossil fuel in the transportation sector while also being renewable and low in carbon emissions. Biodiesel can almost exclusively be used as fuel. Raw elements including oil-rich plants, oil seed crops, fat, palm trees, vegetable oil, and organic waste all have this trait. It also uses renewable natural resources to produce biodiesel (Mizik & Gyarmati, 2021). Due to its total miscibility, it can be utilized either alone or in combination with petroleum diesel. Alkyl esters and long-chain fatty acids are combined to make it. (Ramos et al., 2019).

According to Thangaraj et al., (2019), Biodiesel is created using mono-alkyl esters of long-chain fatty acids that are derived from vegetable oil. Due to its adaptable physical and chemical qualities, it may be utilized in compression ignition (diesel) engines with little to no modification and is biodegradable and environmentally beneficial. Additionally, compared to petroleum-based diesel fuel, it produces far less carbon monoxide, sulfur dioxide, and unburned hydrocarbons during combustion. Because it is made from edible oils, which are currently more expensive than traditional petroleum-based fuels, biodiesel is drawing interest as a liquid fuel. Vegetable oils are changed to make biodiesel.

By fractional distilling crude petroleum oil, which normally contains a combination of pure hydrocarbon molecules, diesel is produced. On the other hand, biodiesel consists of long-chain fatty acids derived from various feedstocks for example plant oils, animal fats, or other lipids also known as triacyl glycerides. Transesterification, the method used to create biodiesel, is frequently aided by acids, bases, enzymes, and other kinds and kinds of catalysts (Rizwanul Fattah et al., 2020).

1.2.2 Transesterification process

In the presence of a catalyst, triglycerides are trans esterified with short alcohols to produce biodiesel. This technology has been successful for producing biodiesel using a variety of feedstocks and is the most widely utilised commercially. This has made renewable energy production very attractive and a promising source of energy because