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TITLE:
THE EFFECT OF NA:AC MASS RATIO ON THERMAL STABILITY OF NA/AC CATALYST FOR BIODIESEL PRODUCTION

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AUTHOR'S DECLARATION

" I hereby declare that this report is the resof my own work except for quotations and summaries which have been duly acknowledged."

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ABSTRACT

This study investigates the effect of Na:AC mass ratios of 1:1, 1:3, and 1:4 on the thermal stability of Na/AC catalysts where activated carbon (AC) is derived from oil palm kernel shell (OPKS) to produce biodiesel. Thermal stability is a key point to be considered in producing catalyst to examine the resistance of the catalyst in extreme conditions. The thermogravimetric analysis (TGA) was used to assess the thermal stability of the catalysts. The findings emphasize the potential of utilizing OPKS as a sustainable raw material for AC which contributes to waste reduction and biodiesel production. To further encourage the growth and application of Na/AC catalysts, it is recommended to evaluate the economic feasibility and environmental impact of producing AC from agricultural by-products. This approach corresponds with the goals of sustainable development and renewable energy developments.

This report gives background details on biodiesel production and the function of Na/AC catalysts which highlights the significance of thermal stability. Moreover, the information of the methodology which involves the preparation of Na/AC catalysts and the use of TGA for thermal analysis. Other than that, this report presents the results and discussion which compares the thermal stability of Na/AC catalyst at different ratios. Ultimately, the report also provides the conclusion of the study with the recommendation to further assess the economic feasibility and environmental impact of producing AC from agricultural wastes to support sustainable biodiesel production.

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CHAPTER 1
BACKGROUND

1.1 Introduction

As the catalytic science and technology has rapidly grow, it involves a wide application of the catalytic materials in biomedicine, devices, environment, and many more (Wang et al., 2022). The catalytic materials undergo all types of harsh states during these applications like high temperature condition (Wang et al., 2022). Hence, thermal stability is frequently an important aspect to discover the feasible catalysts application (Wang et al., 2022). On the other hand, Thermogravimetric analysis (TGA) is one of the methods to analyse the thermal stability. It is a possible method to determine the carbonate and organic content in sediment samples, that also provides precise and accurate data in a time-saving way (Bensharada et al., 2021). It consumes less time, uses automated sample handling to minimise operator error, and able to yield valid data from sample masses (typically 30–50 mg) (Bensharada et al., 2021). Nevertheless, TGA has several advantages that involves the speed of analysis, lower chance of weighing errors due to the usage of automated mass, the fact that it can use a small sample mass, and most importantly the expertise to monitor sample mass through the analysis such as differences in weight sample are tracked constantly with the increase in temperature (Bensharada et al., 2021). TGA is the favoured method in situations for which sample quantity is limited and can be used as an alternative to examine the samples of sediment, which is also highly recommended to determine the carbonate content and organic matter in the sediments (Bensharada et al., 2021).

Biodiesel fuel has become promising as a replacement to petrodiesel fuel (Atadashi et al., 2013). Production of biodiesel is commonly assisted through a reaction called transesterification using homogeneous or heterogeneous catalysts (Atadashi et al., 2013). On the other hand, energy acts as the main carrier in growing the socio-economic (Atadashi et al., 2013). Thus, to enhance the security of energy for economic evolution, it is compulsory to find an alternative energy source such as biodiesel (Atadashi et al., 2013). Biodiesel is biodegradable, sustainable, renewable, and releases low amount of greenhouse gases (Atadashi et al., 2013).

A catalyst is every material that increases the rate of a chemical reaction without getting reduced or consumed. Based on practical perspective, a lot of chemical reactions will not begin