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UNIVERSITI TEKNOLOGI MARA

TITLE:

PREPARATION OF ACTIVATED CARBON FROM BAMBOO USING MECHANICAL MILLING METHOD

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AUTHOR'S DECLARATION

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

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ABSTRACT

This study aims to prepare activated carbon from bamboo using mechanical milling. Bamboo needs to go through drying, grinding, sieving, milling, and carbonization processes. All of these processes are important to ensure that the activated carbon obtained is of high quality with desirable properties such as high surface area, and enhanced adsorption capacity. The bamboo-derived activated carbon (AC) is then analysed via different analyses such as X-ray diffraction (XRD), Elemental Analyser (EA), and microscope imaging. For XRD and EA, the analysis is to observe the characterization of the bamboo-derived AC that underwent different circumstances, like different durations of milling (i.e. 1 hour and 6 hours) with the same speed of rotation, which is 400rpm, and different furnace temperatures when the carbonization process (i.e. 600°C and 700°C) with the same duration, which is 2 hours. While, microscope imaging is being conducted to see the particles of all the samples, which are dried bamboo, bamboo-derived AC 1h, 600°C, bamboo-derived AC 1h, 700°C, bamboo-derived AC 6h, 600°C, and bamboo-derived AC 6h, 700°C up close. With this, the effect of milling can be observed. Not only that, but this study also investigated the effect of bamboo-derived AC on the dehydrogenation properties of complex metal hydride by adding 10% of AC into lithium aluminium hydride, $LiAlH_4$. The objective is to evaluate its potential as a catalyst for improving hydrogen desorption kinetics. These findings contribute to the understanding of the role of mechanically ground bamboo-derived AC in material characterization and its potential as a catalyst for enhanced hydrogen release.

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CHAPTER ONE

BACKGROUND

1.1 Introduction

As years pass by, the production of bamboo-based furniture like tables and chairs becomes high as the demand of people keeps rising, as the population in the world increases (Boran & Barbu, 2013). Also, the production is increasing because of how rapidly bamboo is the fastest-growing plant on earth (Lewis bamboo, 2025). The production of bamboo-based products is increasing especially in Asia as Asia is the richest continent with about 65% of total world bamboo resources (Boran & Barbu, 2013). However, not all bamboo cut from bamboo forests is good for making furniture, as it appears to have cracked or fragile. The worker will throw it whenever the bamboo looks unusable, creating a hassle as the bamboo waste keeps increasing at the landfills (Goh et al., 2024). Throwing it away is not the solution that engineers are looking for. Unusable bamboo can be created to be an activated carbon as the content of carbon in the bamboo is quite high in percentages. Moreover, the demand for activated carbon will continue to increase as its various uses in the industry continue to increase (Mahanim et al., 2011) in line with the increase in global population growth, technological advancements and higher living standards (Goh et al., 2024).

Bamboo is a renewable and sustainable biomass source for activated carbon as it contains high carbon content. Biomass is the main renewable energy source for activated carbon production (Mahanim et al., 2011) and is of interest in the industry due to its environmentally friendly properties. (Goh et al., 2024). By following the suitable activation temperature, bamboo waste can have the potential to be a precursor for the production of activated carbon (Mahanim et al., 2011). To turn bamboo waste into activated carbon, mechanical activation is the best solution as it offers a simple and scalable activated carbon preparation method. This method also is safe for the environment as it does not involve chemical usage. In this study, the mechanical activation involves is a mechanical milling method.