UNIVERSITI TEKNOLOGI MARA

PRODUCTION AND CHARACTERIZATION OF BIO-OIL FROM PYROLYSIS OF GAHARU WASTE

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ABSTRACT

Gaharu is known as the most expensive wood in the world because it can be used in many cultures for its distinctive fragrance, and used extensively in incense and perfume. However, the gaharu residue are still not been used for any purpose and just been drawn as waste. In this research, the gaharu waste was used to produce bio oil as alternative for replaced the depending on the petroleum source. The method used for the experiment was slow pyrolysis. Firstly, the gaharu waste was collected at Bukit Larut, Kuala Lipis and then dried it at room temperature before ground and sieved it for the experiment. The reactor used in this research was fixed bed reactor with electrical furnace heat externally. The mass of the product bio oil produced was measured to analyze the percent yield of bio oil obtained. The experiments were conducted at differences range of temperature that are 400, 500 and 600 ˚C. The heating rate used was constant at rate 1000°c/min and the nitrogen supply at flow rate 0.5 liter/min. The product of bio oil then characterized using Fourier Transform Spectroscopy (FTIR),Gas Chromatography (GC-MS), Bomb calorimeter and CHNS analyzer, Thermo gravimetric Analysis (TGA). From the result obtained after pyrolysis, at the temperature 500°c was indicated as the best condition to give the highest product yield. The maximum yield of the bio oil produced from these conditions was 26.8%. Based on GCMS and FTIR analysis, it was shown that the pyrolysis oils from gaharu waste contains complex compounds mostly functional groups of phenol, alcohols, ketones, aldehydes and carboxylic acids,aromatic and also carbonyl structures. The heating value for the bio oil produced also lower than petroleum that was 23.75 MJ/kg.

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INTRODUCTION

1.1 BACKGROUND OF STUDY

Biomass, wood, wind, sunlight are some of the renewable form of energy resources that has potential to use for energy production. These source of energy are generated from sources which are not finite or exhaustible and it is easy to get and come in nature. Unfortunately, the use of renewable energy are less applied in the industries and transportation usage compare to our primary energy supply such as fossil fuels and charcoal. Besides that, energy also comes in form of non-renewable source such as fossil fuel oil, petroleum and coal. They are known as non-renewable because the resource of fossil fuels on this planet are finite and hard to get as well as can reduce by the time. The excess use of these resources may cause a major pollution to the sea, land and environment, cause oil spill and increased concentration of acid rain. Moreover, the high consumption of non-renewable energy like fossil fuel cause abundance release of greenhouse gas such as sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and carbon monoxide (CO) and these gas will be endangered to the most of animal and human habitats. Non-renewable energy can also be categorize as non-recycle energy because the source not available to use again once they are used completely. These sources are limit to obtain and the way to get them are so difficult because of the high technology needed besides these fuel are easy to deplete at faster rate.

Nowadays, our generation hard to survive without use motorcars and motorcycle as their transportation and hard to live without have an electricity source. They are tending to use as many as non-renewable energy such as fossil fuel in their transportation and in electrical supply without concerning the release of dirty gas to the environment. Besides, most of the industries also use fossil fuel to make operation to the plant and use this source as utilities for their plant. According to Edward and Myers (2016) development of industrial is the major source of the pollution and they often release the greenhouse gases through smokestack emission by burning the fossil fuel. With the high