UNIVERSITI TEKNOLOGI MARA

PHYSICOCHEMICAL CHARACTERISATION OF CHAR SLURRY FROM FISH BASED FOOD WASTE

NOOR HANINI BINTI HASHIM

Thesis submitted in fulfillment of the requirements for the degree of

Bachelor of Engineering (Hons) Chemical and Bioprocess

Faculty of Chemical Engineering

July 2017

ACKNOWLEDGEMENT

First of all, Alhamdulillah and thank to Allah SWT for giving me His blessing and strength throughout my study for this final year as an Engineering student in Universiti Teknologi MARA. Much thanks I would like dedicate to my adorable and dedication family to give me support especially my mother, , whenever I faced with stress and sometimes came up with hopeless but they brought me up when I was down once. My special gratitude for my one and only the best supervisor that I have, IR Normadyzah Binti Ahmad, for willing to accept me as her research student and guided me well in this research project. Nothing to say but only special thanks I would like to say to her as she is always being there in my difficult times and supports me until the end. May Allah bless all of them who are make my life easier for my final year project. Not to forget, much thanks for all lab operators in Chemical Engineering Faculty especially those who are related with my methodology and one of them is Puan Rohaida Binti Zainordin from Instrumentation Lab for her well guidance in conducting CHNS Elemental Analyzer and bomb calorimeter.

ABSTRACT

In this research, fish was used as a main material (sample) to conduct the study. Specifically, only certain parts of fish were selected by which the bones, head and the flesh were fully utilized for the study that will be conducted. The parts of fish were dried in the oven for 80^{o}C for 24 hours to lower the moisture content. The dried parts were then undergone pyrolysis process with different temperatures of 200 to 500^{o}C with the residence times from 2 to 6 hours. The char residues produced were weighed in order to determine the percentage of char yield. The char was ground into powder for analyzing the carbon content in the biomass prior to mixing with isobutanol to produce liquid fuel (bio char slurry). The sample was then analyzed for the energy density by using bomb calorimeter. The percentage of yield produced from the biomass was calculated and the results showed that there is the decreasing pattern as the temperature for the pyrolysis increases. At temperature of 200^{o}C, 5 hours of bones sample gave the highest percentage on the char yield followed by 300^{o}C, 400^{0}C and 500^{o}C. The carbon content analysis conducted by using CHNS Elemental Analyzer gave a result with decreasing in percentage as the temperature increase by which the highest is at temperature of 200^{o}C, 3 hours of flesh sample. After that, energy density obtained showed the highest is being contributed by flesh sample at 300^{o}C at 4 hours. In addition, the pattern of energy density data are corresponding to the pattern of carbon content percentage by which the decreasing of carbon content gives decreasing in energy density as the temperature increase in pyrolysis process. Overall, the best temperature and duration for pyrolysis in order to produce energy density that suitable in making fuel is fish flesh sample at 300^{o}C at 4 hours.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

According to the *Food and Agriculture Organization of the United Nations (FAO)* in 2014, food waste is defined as part of food loss (low in quality and quantity of food) with the purpose to discard or can be utilized as alternative way which is safe and nutritious for human consumption from the earlier of production towards the end level of household consumer. In addition, through the research being made from FAO in 2011, it showed that each year, for about approximately one-third of all food that has been produced for human consumption became loss and waste worldwide. Apart from that, from the research conducted by FAO, it is estimated that roughly about 1.3 billion tonnes of edible parts of food have been thrown away as wastage with generally the value of food loss together with the food waste was US$ 680 billion in industrialized countries whereas US$ 310 billion for those of developing countries. Furthermore, the statistics showed that the countries undergoing development and industrial activities discarded about 670 and 630 million tonnes of food respectively. It has been identified that 40% of the loss occurred in the developing countries is due to the post-harvest and processing levels and different from with industrialized countries which exceed 40% in retailing and consumer levels. The retailing level attributed in large loss and waste of food quantities because of quality standards which emphasized too much on the appearance of the food. Food appearance of the food is one of the important parameters for food marketing which is the drawback towards the food waste.