UNIVERSITI TEKNOLOGI MARA

TREATMENT OF AGING LEACHATE USING BIOCHAR FROM TAPIOCA SKIN

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Dissertation submitted in partial fulfillment of the requirements for the degree of

Bachelor of Engineering (Hons.) Chemical and Bioprocess

Faculty of Chemical Engineering

July 2017

ABSTRACT

Biochar is believed to have the ability in treating aging leachate through contaminants adsorption mechanism due to its favorable physical or chemical surface characteristics. Biochar derived from tapioca skin was heated to a temperature of 300^{o}C and analyzed for BET surface area. Jar test apparatus was used to study the ability of biochar in TSS, turbidity, color, COD and heavy metals removal. Through this study, pH of solution, biochar dosage and retention time were varied. Based on the result obtained, the surface area of biochar was 2.0131 m^2/g with pore volume of 0.005343 cm^3/g. Moreover, it was found that high pH solution can cause significant reduction of TSS, turbidity, color, COD and heavy metals concentration. However, variation in biochar dosage and retention time did not bring great impact to the pollutants removal in leachate. Various modifications should be done on the biochar surface to activate it and improve its efficiency through various contaminants removal so that allowable discharge standard requirement for leachate is met.

ACKNOWLEDGEMENT

I take this opportunity to express my profound gratitude and deep regards to my supervisor, Prof Madya Dr Kamariah Noor Ismail for her exemplary guidance, monitoring and constant encouragement throughout the course of this thesis. The blessing, help and guidance given by her time to time shall carry me a long way in the journey of life on which I am about to embark.

I also take this opportunity to express a deep sense of gratitude to all staff in the Department of Chemical Engineering UiTM Shah Alam, especially Encik Mohibbah for his cordial support, valuable information and guidance, which helped me and myfriend in completing this task through various stages.

I am obliged to my FYP mate, Sabariah binti Nawawi for her guidance and time during the discussion of our report. I am grateful for her cooperation during the period of my thesis.

Lastly, I thank almighty, my parents, brother, sister and other friends for their constant encouragement and valuable support without which this thesis would not be possible. They always be by my side when I needed them the most.

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CHAPTER 1

INTRODUCTION

1.0 RESEARCH BACKGROUND

The simplicity, landscape-restoration of holes from mineral workings and low price of sanitary landfill management making these advantages as a nowadays common method of municipal solid waste disposal (Aziz *et al.,* 2011). However, the generation of aqueous effluent through the percolation of rainwater called as leachate becomes the major weakness produced within the sanitary landfill (Shehzad *et al*., 2015). Leachate produced from sanitary landfill is a dark liquid in colour containing highly variable composition with the features of recalcitrant which is mostly contributed by the generation from the biochemical process occur in waste's cells. Moreover, the inherent of water content from the wastes themselves also can contribute to leachate production (Renou *et al*., 2008).

As discussed by Müller *et al.* (2015), conditions of formation and composition of leachate are complex and variable since it depends on various factors such as surrounding environment condition, characteristics of waste generated, operational of the landfill peculiarities and the most important is the decomposition of process dynamic that take place within the landfill cells. In evaluating and planning for the treatment systems, leachate characteristics need to be analyzed in order to identify the four phases of landfill which are aerobic, anaerobic, initial methanogenic and stabilization which then indicate the age of the landfill land.

As stated by Brennan *et al.,* (2017), there are huge amounts of pollutants in leachate such as ammonium nitrogen, chloride, sodium, potassium, nitrogen, boron, solvents, phenols, total acidity, total alkalinity, total hardness and heavy metals. Heavy metals include the element of iron, manganese, lead, cadmium and many more. Other than that, leachate also having high concentration of biochemical oxygen demand (BOD) and chemical oxygen demand (COD). Composition of