REMOVAL OF HEAVY METALS USING BANANA FROND AS ADSORBENTS (Cr & Cu)

NUR AMIRA JASMIN BINTI MAT REFIN

This report is submitted in partial fulfillment of the requirements needed for the award of Bachelor of Engineering (Hons.) Chemical

FACULTY OF CHEMICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
SHAH ALAM

JULY 2019

ABSTRACT

The discharge of metal contamination in wastewater from industries without compliance the acceptable value in schedule fifth of Environmental Quality (Industrial Effluent) Regulations 2009 can disturbing the aquatic life and can harm the human health. Eight types of adsorbents were developed from the yellow colour of banana leaves to remove Cr and Cu ions from simulated solution. Within 8 types of adsorbents, first four adsorbents were prepared through physical treatment, while another 4 adsorbents were prepared through chemical treatments with an addition of vinegar. For every treatment consist of 1 uncalcined adsorbent and 3 kind of calcined adsorbent that carbonized at 3 different temperatures (350,450 and 550). By using atomic adsorption spectrometer (AAS), this adsorption by bio-waste were conducted to identify the optimum and effective condition for the removal of Cr and Cu ions. Adsorption was carried out in batch processes with 2 different simulated solutions (chromium and copper) and different concentrations, varying amount of adsorbents and agitation time. From the batch studies, it was found that at the condition of 100ml/50ppm stock solution of heavy metal, 0.5g of adsorbents and 120 minutes' agitation, the highest percentage chromium ions removal was 86.62% by CCT350. While, 98.53% was the maximum removal of copper ions by CPT550 which achieved when 50ppm/50ml of solution and 0.5g amount of adsorbent used. The surface functional group (i.e., amide, carboxylic and alkyne) of adsorbent were examined by Fourier Transform Infrared Technique (FT-IR).

ACKNOWLEDGEMENT

I am very grateful to Allah Almighty Who give me the strength and opportunity to complete the research on environmental related issue. Immeasurable appreciation and gratitude to the Professor Madya Hasnora Jafri for her advice, guidance, encouragements and valuable comments that benefited me much in completion the research. Sharing her knowledge, helped in analysis the data and manuscript are really made me thankful to has a supervisor like you.

A special thanks to the laboratory technicians of Chemical Engineering Faculty especially Encik Nazmi who are very helpful in idea sharing about my research to ensure my research in good position. Last but not least, I would also like to thank my family and friend. They were always supporting and encouraging me with their best efforts. They gave me the strength to face the difficulties that I had throughout finishing this research project.

TABLE OF CONTENT

CHAPTER ONE
INTRODUCTION

1.1 Research Background

There are three major sectors that contribute to Malaysian economic which are agriculture, manufacturing and servicing. The agriculture sector focuses on working of soil in order to produce crops while servicing is focused on providing or creating something that give convenient to others. The manufacturing sector is the sector that relates in processing and producing a product. Unfortunately, too many developments in the manufacturing industry can indirectly cause problems for the environment, especially water pollution, which due to the uncontrolled discharge of waste from factories. In addition, waste from the processing is one of current predominant environment issues (R & G, 2017).

The waste sources from the electroplating industry, pigment, printing, fertilizers industry, thermoplastic, batteries, paper industry and others (Abirami, Shobiya, Anitha, Amutha, & Kalyani, 2016a) can cause water pollution due to the contaminants of heavy metals during the discharged in the water or wastewater. The examples of heavy metals are lead (Pb), cadmium (Cd), zinc (Zn), mercury (Hg), chromium (Cr), copper (Cu), Iron (Fe), etc. (Ashokkumar et al., 2016). Although heavy metals are one of the environmental pollutants (Bouabid et al., 2018) , but some of these like zinc or copper is needed by living organisms such as human for growth. However, excessive amounts of heavy metals can be toxic and give disadvantages to aquatic ecosystem. Hence, there is need to remove the heavy metal from the water in order to control the pollution and aquatic life.

Recent studies have discovered several techniques in removing heavy metals in order to control the pollution, such as chemical precipitation, coagulation and flocculation, electrochemical treatment, ion exchange, membrane filtration and biological method (Pawar & Bhosale, 2018). Bio-sorption is one of the methods under the biological method that used in removing heavy metals. Sorption is a process that relates to adsorption and absorption. Adsorption process has become one of alternative treatment for water pollution. Adsorption in wastewater can be defined as a method to