UNIVERSITI TEKNOLOGI MARA

CHEMICAL MODIFICATION OF PSEUDO STEM OF *MUSA PARADISIACA L.* IN TREATING COPPER(II) IONS FROM WASTEWATER AND ISOTHERM STUDIES

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ABSTRACT

The biosorption of Cu(II) from dilution of wastewater by using chemically modified Pseudo stem with sodium hydroxide (NaOH), calcium chloride (CaCl) and ethanol (EtOH) was investigated. Atomic absorption spectrophotometer (AAS) method was established to determine the final concentration of Cu(II). The batch experiments showed that biosorption efficiency was dependent on the initial metal ions concentration, contact time and dosage of biosorbent. The optimum pH and temperature for the removal of Cu(II) was 5.9 and 27˚C respectively. The maximum adsorption of Cu(II) ions was 79% or 77.17 mg/h for 75mg/l of initial Cu(II) concentration. The optimum time of Cu(II) biosorption was within 60minutes. The results of experiments were analysed using three adsorption isotherm models which are Langmuir, Freundlich and Redlich-Peterson. Thus, the Redlich-Peterson model was the best isotherm to represent the data with R^2 value of 0.988. Heavy metals in the wastewater are classified as non-biodegradable and can give serious health disorder and environment which can cause anaemia, respiratory effect, bad smell and cancers.

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CHAPTER ONE

INTRODUCTION

1.1 RESEARCH BACKGROUND

Adsorption is a wastewater purification technique for removing a wide range of heavy metal from industrial wastewater. This process takes place when the heavy metal (adsorbate) in wastewater binds them to the surface of adsorbent. The adsorbent must have large pore volume and internal surface area to permit adsorption as well as increasing adsorption effectiveness. The effectiveness of the adsorption treatment can be altered by different temperature, pH value, physical and chemical pre-treatment, concentration of heavy metal, contact time and concentration adsorbent. Moreover, there are other conventional methods to treat heavy metal including chemical precipitation, ion exchange and solvent. However, adsorption method has many advantages over other methods such as recovery of metal value, selectivity, sludge free operation, cost effectiveness and meeting of strict discharge specifications.

The term 'heavy metal' is collectively applied to a group of metals with density greater than 5 g/cm^3 and atomic number above 20 (Charif Gakwisiri et al., 2012). Hence, the density and atomic number of copper are 8.96 $g.cm^{-3}$ at 20°C and 29 (Chemical Properties of Copper, 1996). Copper (II) metal is one of highly toxic and very poison heavy metal that can directly enter into human bodies either ingestion or inhalation process. It can give serious health disorder such as anaemia, hypertension and death. However, regulation of wastewater was established to minimise environmental and human exposure to the metal hazardous and metal toxicity. Hence, the maximum contaminant level (MCL) standards of copper was established by USEPA is 1.0 mg/L (The Alumina Association, 2016).

Metal contamination is considered to be one of the most ubiquitous and complex environmental today. Industrialization activity like produced industrial wastewater that may contain several of toxic metals such as Cadmium (Cd), lead (Pb), Copper (Cu), Zinc (Zn), Nickel (Ni) and Chromium (Cr). A large volumes of wastewater was discharged