UNIVERSITI TEKNOLOGI MARA

REMOVAL OF PB(II) FROM AQUEOUS SOLUTION USING SAWDUST COLONISED BY *PLEUROTUS OSTREATUS* FUNGAL MYCELIUM IN PACKED BED COLUMN

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ABSTRACT

The potential of sawdust colonised by *Pleurotus ostreatus* fungal mycelium as biosorbent in Pb(II) removal using packed bed column was investigated. This study focused on effect of flowrate to determine the efficiency of sawdust colonised by *Pleurotus ostreatus* fungal mycelium in removing Pb(II) from aqueous solution. The flowrates chosen were 2, 5, 7, 10 and 14mL/min at fixed bed height of 100 mm and 50 mg/L Pb(II) concentration.As the flowrate increased, the breakthrough curve shift towards the origin, the break point time, removal efficiency and the uptake capacity of Pb(II) decreased, due to an insufficient residence time of the solution in the column. The optimum percentage removal was obtained at 88.6% and the uptake was 27.12 mg/g with the flowrate of 2 mL/min. Thomas, Adams–Bohart and Yoon–Nelson models were applied to the experimental data to establish the breakthrough curves using linear regression and to determine the characteristic parameters of the column. Experimental results fitted well to Adam-Bohart model. Application of sawdust colonised by *Pleurotus ostreatus* fungal mycelium in industrial electroplating wastewater indicated that it is highly potential as a biosorbent for biosorption of heavy metals. To date this represents the only report on the potential of *Pleurotus ostreatus* fungal mycelium in removing heavy metals under packed bed column.

Keyword: Biosorption; Packed bed column; Pb(II); sawdust colonised by *Pleurotus ostreatus* fungal mycelium

Candidate's Declaration

I declare that the work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This topic has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

In the event my dissertation be found to violate the conditions mentioned above, I voluntarily waive the right of conferment my degree and agree to be subjected to the disciplinary rules and regulations of Universiti Teknologi MARA.

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CHAPTER 1

INTRODUCTION

1.0 Background

In recent years, environment pollution by heavy metals has become a major concern worldwide. Heavy metals constitute a group of pollutants that is dispersed into the environment through both naturally occurring process and by human activities. Metals ions in water can occur naturally from leaching of ore deposits. Anthropogenic sources of heavy metals generally come from various industrial processes like electroplating, metal processing, chemical manufacturing, electric power generating, coal and ore mining, smelting and metal refining, metal plating and others (Yin *et al*., 1999; Yalchinkaya *et al*., 2002; Mata *et al*., 2007). Mining operations are responsible for the contamination of soils and waters with tailings that release toxic metals such as As, Cu, Ni, Pb, and Zn (Schneegurt *et al*., 2001). Uncontrolled release of heavy metals into the environment can create toxic or inhibitory effect on living organisms and ecosystems.

The removal and recovery of heavy metals from wastewater is important in the protection of the environment and human health. Methods for removing metal ions from aqueous solution mainly consist of physical, chemical and biological technologies (Wang and Chen, 2009). Conventional methods for removing heavy metals from industrial effluents include chemical precipitation, chemical oxidation and reduction, ion exchangers, evaporation recovery, electrodialysis, membrane technologies, adsorption and filtration (Mahvi, 2008). However, chemical precipitation and electrochemical treatment are ineffective, especially when metal ion concentration in aqueous solution is in the range of 1 to 100 mg/L. Besides, these methods produce large quantity of sludge which is difficult to treat. Ion exchange, membrane technologies and activated carbon adsorption process are extremely expensive when treating large amount of wastewater containing heavy metal. Removal of heavy metals by conventional means is technically and economically