

**UNIVERSITI TEKNOLOGI MARA**

**REMOVAL OF CADMIUM FROM AQUEOUS  
SOLUTION USING *PLEUROTUS OSTREATUS* AS  
BIOSORBENT**

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Dissertation submitted in partial fulfillment of the requirements for the  
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## ABSTRACT

Removal of cadmium from aqueous solution using *Pleurotus ostreatus* as biosorbent was studied. The study was focused on the evaluation of the impact of amount of biosorbents, pH, and contact time and cadmium concentration on cadmium (ii) ions removal from aqueous solution using *Pleurotus ostreatus* as biosorbent and continued with the adsorption isotherms and kinetics determination. The optimum percentage removal value was found as 86% with the amount of 0.5 g of *Pleurotus ostreatus* biosorbent. Optimum percentage uptake was found to occur at acidic equilibrium reached after 10 minutes contact time with 89% and of 4.5 mg/g respectively. *Pleurotus ostreatus* biosorbent removed 85% of cadmium (II) at a concentration of 10 mg/L cadmium (II) ions. The optimum uptake of cadmium (II) ions by *Pleurotus ostreatus* biosorbent was 5.08 mg/g at 60 mg/L of cadmium (II) ions concentrations. The langmuir isotherm model fits significantly better experimental data than the Freundlich isotherm and BET isotherm model. Kinetic studies indicate that cadmium removal using *Pleurotus ostreatus* biosorbent follows electroplating wastewater than from synthetic wastewater. The findings indicated promising biosorption of cadmium using *Pleurotus ostreatus* as biosorbent.

Keywords: Biomass; Biosorption; Cadmium; *Pleurotus ostreatus*

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

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## TABLE OF CONTENTS

Title Page	Page
Abstract	i
Candidate's Declaration	ii
Acknowledgements	iii
Table of Contents	iv
List of Tables	viii
List of Figures	ix
List of Abbreviations	xi
<b>CHAPTER 1      INTRODUCTION</b>	<b>1</b>
1.1      Background	1
1.2      Problem Statement	2
1.3      Objective	3
1.4      Significant Of Study	4
1.5      Scope of Study and Limitations of Work	4
<b>CHAPTER 2      LITERATURE REVIEW</b>	<b>7</b>
2.1      Heavy Metal Pollution	7
2.1.1      Toxicology of cadmium	9
2.2      Conventional Method In Heavy Metal Removal	9
2.2.1      Reverse Osmosis	10
2.2.2      Electrodialysis	10
2.2.3      Ultrafiltration	10
2.2.4      Ion-exchange	11
2.2.5      Chemical Precipitation	11
2.2.6      Phytoremediation	11

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

Heavy metal pollution is an environmental problem of worldwide concern. Heavy metal pollution has formed a serious threat to the global ecosystem, and posing a significant threat to the environment and public health because of their toxicity, accumulation in the food chain and persistence in nature (Bahadir *et al.*, 2007). Rapid industrialization and improper management of industrial waste are the major factors responsible for the release of heavy metals into the ecosystems. Many industries such as metallurgical, galvanizing, metal finishing, electroplating, mining, power generation, and electronic device manufacturing and tannery industries produce large quantities of wastewater containing metals (Rengaraj *et al.*, 2003).

Industrial effluent must be treated prior to the level stipulated by regulations prior to being discharged to the receiving environment. Due to the stringent regulations, there is an increased in the demand for new technologies for metal removal from industrial wastewater. This has resulted in an inflow of foreign technologies into Malaysia. While this is good and currently needed for the country, local technology utilizing locally available material must be developed. Waste from agricultural industry has shown to have high potential to be used as biosorbents. However research in Malaysia has not focus significantly in this area.

Sorption is a physicochemical process commonly used in removing heavy metal from aqueous solution. Biosorption involves using solids of natural origin, such as microorganisms (alive or dead) or their derivatives in removing pollutants from the aqueous environment (Preetha and Viruthagiri, 2005). Biomaterials like fungi have proven to be efficient and economical for removal of heavy metals from dilute