



شبكة المعلومات الجامعية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ





شبكة المعلومات الجامعية



شبكة المعلومات الجامعية

التوثيق الالكتروني والميكرو فيلم

جامعة عين شمس

التوثيق الالكتروني والميكرو فيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
على هذه الأفلام قد اعدت دون أية تغيرات



يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %



شبكة المعلومات الجامعية



بعض الوثائق الأصلية تالفة



شبكة المعلومات الجامعية



بالرسالة صفحات

لم ترد بالأصل

Removal of Zinc Metal from Industrial Wastewaters by Some Fungi

A Thesis

submitted in partial fulfillment for the degree of Master of science

**In
Microbiology**

By

Essam Mohamed Ahmed Abd El Rahman

B. Sc. Microbiology –Chemistry

Faculty of Science Ain Shams University

1994

Prof. Dr. Fawkia M. El Beih

Prof. of Microbiology
Microbiology Dept.,
Faculty of Science
Ain Shams University

Fawkia el Beih

**Ass. Prof. Dr. Abd El
Hamid. A. Hamdi**

Assistant Professor of Natural
and Microbial Products
Chemistry of Natural and
Microbial Products Dept.
National Research Center

Hamdy A.A.

Dr. Adel A. El -Mehalawy

Lecturer of Microbiology
Microbiology Dept.
Faculty of Science
Ain Shams University

Adel

Microbiology Department.

Faculty of Science

Ain Shams University

2000

*B
70Vp*

This thesis has not been previously submitted for any degree at
this or any other university

Signed

Essam Mohamed Ahmed

**Essam Mohamed Ahmed
Abd El Rahman**

Approval sheet

Name : Essam Mohamed Ahmed Abd El Rahman

Title: Removal of Zinc Metal from Industrial Wastewaters
by Some Fungi.

Supervisors

Approved

1. Prof. Fawkia M. El Beih.... *Fawkia M. El Beih*
2. Dr. Abd El Hamid A. Hamdi... *Hamdy A. A.*
3. Dr. Adel A. El Mehrawy ... *Adel A. El Mehrawy*

10920 H. 2024-21
10920 H. 2024-21
10920 H. 2024-21
10920 H. 2024-21

10920
10920
10920
10920

ACKNOWLEDGMENT

I wish to express my sincere gratitude to Prof. Dr. F. M. El Beih, Professor of Microbiology, Faculty Of Science, Ain Shams University, for her supervision and help during practical part and kind and constitutive criticism in reviewing this thesis.

My deep thanks and appreciation are also extended to Prof. Dr. L. A. Sallam professor of Natural and Microbial Products Chemistry, National Research Center, for suggestion the topic of this work, continuous encouragement, valuable guidance as well as reviewing this work.

Grateful thanks are also extended to Dr. A. A. Hamdi assistant Professor of Natural And Microbial Products Chemistry, National Research Center for his supervision during the work and sincere help in preparing the manuscript. My sincere gratitude is greatly expressed to him.

I am also indebted to Dr. A. A. El mehlawy lecturer of Microbiology, Microbiology Dept., Faculty Of Science, Ain Shams University, for his personal supervision and valuable instruction in reviewing the manuscript.

Moreover, the author would like to acknowledge all the members of Natural and Microbial Products Chemistry Dept. for their cooperation and help, which enabled this work to be accomplished.

Contents

	page
List of Tables	vi
List of figures	vii
Introduction.	
Aim of The work	
Literature Review.....	1
1.1 Pollution problems.....	1
1.2. Metal uptake by the microorganisms and the biological treatment of the metal pollutants.....	6
1.2.1 Interaction between the metals and the living microbial cells.....	7
1. Intracellular accumulation.....	7
2. Cell wall associated metals.....	7
3. Metal- siderophore	8
4. Extracellular mobilization / immobilization of metals by microbial metabolites.....	8
5. Extracellualr polymer- metal interactions.....	8
6. Transformation and volatilization of metals....	9
1.2.2 Interaction between the metal and the dead microorganisms	9
1.3. Uptake of zinc ions by fungi.....	18
1.3.1 Living biomass.....	21
A. Yeast.....	22
B. Filamentous fungi.....	23
1.3.2 Dead biomass.....	24
1.4. Assessment of sorption performance.....	25
1.5 Utilization of the immobilized biomass	27
1.5.1 Immobilization technique	27
1.5.2 Utilization and fidelity of the immobilization technique in biosorption of metals	29
1.6. Application of biosorption for metal removal ..	34

	page
2. Materials and Methods	37
2.1. Experimental fungi	37
2.1.1 Collections of samples	37
2.1.2 Isolation and identification methods.....	37
1. Isolation techniques.....	37
2. Identification of the isolated fungi	39
3. Maintenance of fungi	39
2.2. Preparation of the biomass	40
2.3. Preparation of the stock solutions	40
2.4. Preparation of buffer solutions	40
2.5. The metal uptake experiments in batch system.....	41
2.5.1 Comparison between different isolated fungal species according to the amount of the metal uptake	41
2.5.2 Effect of pH values on zinc ions removal by the selected fungal species.....	41
2.5.3 Effect of residence time on zinc metal removal by the selected fungal species.....	42
2.5.4 Effect of shaking speed on zinc ions removal by the selected fungal species.....	42
2.5.5 Effect of temperatures on removal of zinc by the selected fungal species	43
2.5.6 Effect of different ion concentrations on removal of zinc by the selected fungal species .	43
2.5.7 Effect of different biomass weights on removal of zinc by the tested fungal species	43
2.5.8 Zinc sorption isotherm in batch system and comparison with Langmuir model.....	44
2.6. Biosorption by immobilized biomass	44
2.6.1 Removal of zinc metal ions using fungal biomass immobilized on calcium alginate	44

	page
2.62 Removal of zinc ions using fungal biomass immobilized on polyacrylamide gel ..	45
2.6.3 Removal of zinc metal ions using fungal biomass immobilized on silica gel	45
2.6.4 Breakthrough curves for biosorption column packed with immobilized biomass on silica gel.....	47
2.6.5 Effect of changing weights of the immobilized biomass on removal of zinc metal ions.....	47
2.6.6 Sorption and elution of loaded zinc metal ions from immobilized fungal biomass	48
2.6.7 Efficiency of desorption with 0.1N HCl using different loaded zinc concentrations	48
2.6.8 Effect of changing flow rate of Zn^{2+} bearing solution on metal removal using immobilized fungal biomass.....	48
2.6.9 Efficiency of the column for reuse for zinc metal ions removal (Recycling).....	49
2.7. Application for the utilization of the immobilized biomass for metal removal / recovery from industrial wastewaters	49
2.7.1 Removal of zinc metal from industrial wastewaters... ..	49
2.7.2 Recovery of the biosorbed zinc metal from the immobilized biomass	49
2.8. Instrumentation	50
3. Experimental Results.....	51
3.1. Identification of the isolated fungi.....	51