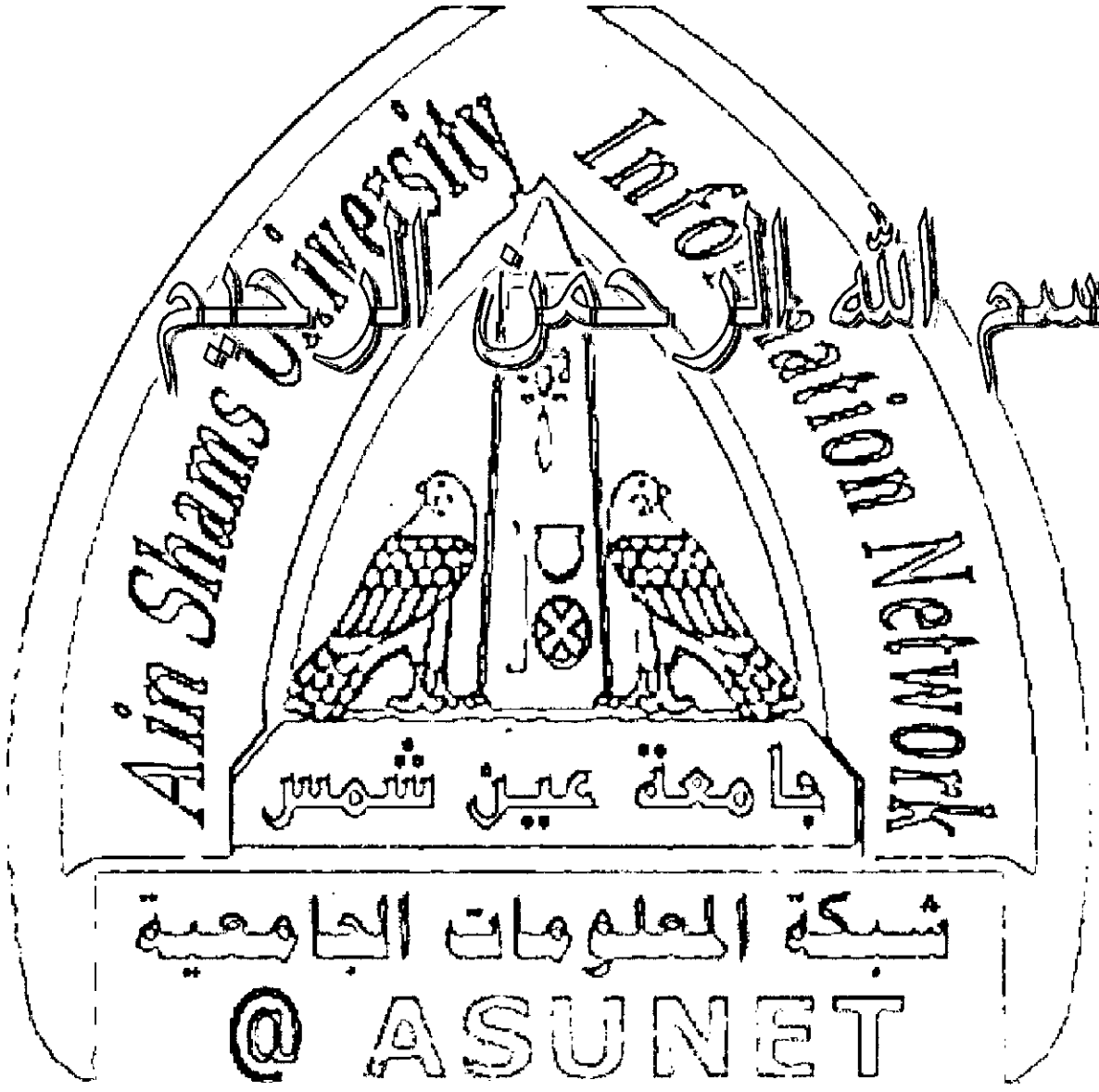
شبكة المعلومات الجامعية



شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

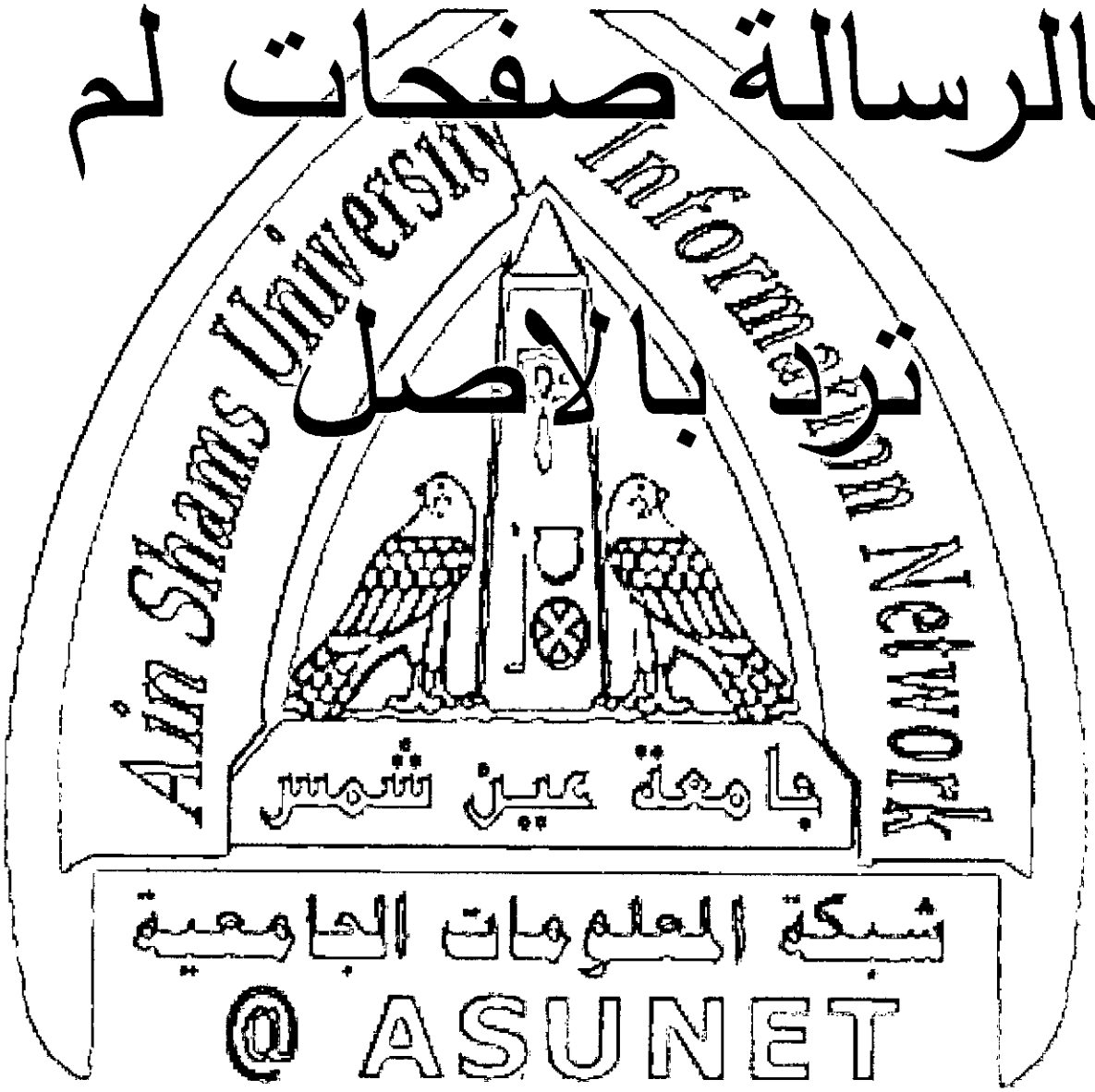
قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأفلام بعيدا عن الغبار
في درجة حرارة من ١٥-٢٥ مئوية ورطوبة نسبية من ٢٠-٤٠%

To be Kept away from Dust in Dry Cool place of 15-25- c and relative humidity 20-40%



بالرسالة صفحات لم ترد بالاصل

بعض الوثائق الأصلية تالفة

Benha University
Faculty of Science
Department of Chemistry

ENVIRONMENTAL STUDIES AND CHEMICAL TREATMENT FOR SOME INDUSTRIAL WASTES

A Thesis

Submitted to

Chemistry Department ,Faculty of Science
Benha University

For

The partial fulfillment of master degree of Science in Chemistry

By

ADEL HUSSIEN ABDEL ZAHER KAMAL El-DIN

Supervised By

Prof. Dr. Ahmed Khalil Ghonaim
Professor of Analytical Chemistry
Faculty of Science,
Zagazig University

Prof. Dr. Ali Hassan El Nikheli
Professor of Chemical Engineering
Higher Technological Institute
10th of Ramadan City.

Dr. Moustafa Ibrahim Moustafa
Assistant Professor of Inorganic Chemistry
Faculty of Science,
Benha University

Dr.Sammy Khodary Badar
Lecturer of Organic Chemistry
Faculty of Science,
Benha University

2005

ENVIRONMENTAL STUDIES AND CHEMICAL TREATMENT FOR SOME INDUSTRIAL WASTES

A Thesis Submitted to

Chemistry Department ,Faculty of Science

Benha University

By

ADEL HUSSIEN ABDEL ZAHER KAMAL El-DIN

For

The partial fulfillment of master degree of Science in

Chemistry

	Under Supervision of	Signature
1-	Prof. Dr. Ahmed Khalil Ghonaim Professor of Analytical Chemistry Faculty of Science, Zagazig University	
2-	Prof.Dr.Ali Hassan El Nikheli Professor of Chemical Engineering, Higher Technological Institute, 10th of Ramadan City.	
3-	Dr. Moustafa Ibrahim Moustafa Ass.Professor of Inorganic Chemistry Faculty of Science, Benha University	
4-	Dr.Sammy Khodary Badar Lecturer of Organic Chemistry Faculty of Science, Benha University	

2005

ENVIRONMENTAL STUDIES AND CHEMICAL TREATMENT FOR SOME INDUSTRIAL WASTES

A Thesis Submitted to

Chemistry Department ,Faculty of Science

Benha -Zagazig University

By

ADEL HUSSIEN ABDEL ZAHER KAMAL El-DIN

For

The partial fulfillment of master degree of Science in Chemistry

	Approved By	Signature
1-	**Prof. Dr. Raafat Moustafa Issa** Professor of Physical and Inorganic Chemistry Faculty of Science, Tanta University	
2-	**Prof. Dr. Ragaa El-Shaikh Shohaib** Professor of Analytical Chemistry Faculty of Science, Zagazig University	
3-	**Prof. Dr. Ahmed Khalil Ghonaim** Professor of Analytical Chemistry Faculty of Science, Zagazig University	
4-	**Dr. Moustafa Ibrahim Moustafa** Ass.Professor of Inorganic Chemistry Faculty of Science, Benha - University	

2005

بسم الله الرحمن الرحيم

"۞ قال ربى اشرح لي صدري ۞

ويسر لي أمري ۞ واحلل عقدة من

لساني ۞ يفقهوا قولي ۞".

صدق الله العظيم

ACKNOWLEDGMENT

The author wishes to express his great thanks and sincere Appreciations to ***Prof. Dr. Ahmed Ghonaim****, Professor of Analytical Chemistry, Faculty of Science, Zagazig University. For his support and Valuable guidance throughout this work.*

The author wishes also to thank ***Prof. Dr. Ali Hassan El- Nikheli*** *Professor of Chemical Engineering, Higher Technological Institute, 10th of Ramadan city, for his help and support.*

The author wishes to express his deepest thanks and gratitude to ***Dr. Mustafa Ibrahim Moustafa,*** *Assistant Prof. of Analytical Chemistry and* ***Dr. Sammy Khodary Badar*** *Lecturer of Organic Chemistry, Faculty of Science, Benha - Zagazig University, not only for suggesting the Subjects investigated, but also for their advice and valuable criticism during the course of this work.*

Thanks also are to ***Prof. Dr. H.A.Dessoki*** *head of chemistry department; Faculty of Science, Benha University and to staff members.*

I am very grateful to ***Eng. Nabil salama*** *from Fresh Co. Electrical device in 10th of Ramadan city. For his help and data he provided me.*

ABSTRACT

The release of heavy metal ions into our environmental is still large. It is well known that some metal ions can be poisonous, otherwise have harmful effect on many forms of life.

This thesis is concerned with the study of the treatment of such wastewater using synthetic polyurethane as an exchange resin and clay to remove heavy metals from single – ion solution as well as from a mixture of them.

All experiments were conducted using 10 - 50 ppm solution of $CuSO_4$, $ZnSO_4$, $NiCl_2$ and $K_2Cr_2O_7$, at different lapses of time. The mixtures were filtered and the heavy metal ions concentrations were determined in the aqueous phase.

Polyurethane in pH 4, showed sometimes increase in uptake compared with that of neutral solution in the order $-Cr_2O_7^{2-} > Cu^{2+} > Ni^{2+} > Zn^{2+}$. Metal ions accumulation from a mixed solution was shown to decrease slightly for Cu^{2+} , Ni^{2+} and poor for Zn^{2+} , while it was effective only for $-Cr_2O_7^{2-}$, about 91.6 %removal.

The heavy metal ions cations studied, adsorbed by clay minerals from industrial wastewater of electroplating processes have been studied experimentally. We can observe that the separation of heavy metal ions by clay minerals is effective in the order $Cu^{2+} > Zn^{2+} > Ni^{2+} > -Cr_2O_7^{2-}$ only in absence of cyanide ions.

English summary

This thesis is concerned with the study of the removal of Zn^{2+}, Cu^{2+}, Ni^{2+} and $-Cr_2O_7^{2-}$ ions from wastewater samples of electroplating process.

The study comprised firstly on the method of preparation of polyurethane resins and defines its structure by IR and NMR spectra.

Secondly treatment of wastewater samples using polyurethane as an exchange resin and natural clay to remove heavy metal ions from single ion solution as well as from a mixture of them, also from individual wastewater samples from Fresh company in 10^{th} Ramadan city.

The results of the study the effect of amount of polyurethane for 100 ml of solution at different time with agitation speed 400 rpm showed that:

(I) In case of Cu^{2+}, an increase in amount of polyurethane leads to an increase in the percent adsorption of Cu^{2+} up to 73 % using 15 g /3h.

(II) Where a maximum adsorption of $-Cr_2O_7^{2-}$ ions (91.9 %) was obtained on using 15 / 3h, compared with only 52 % on using the resin in neutral form, this is explained in the light of keto-enol tautomerism phenomen taking place in polyurethane.

(III) An increase the amount of resin from 7-30 g show a steady increase in the Ni^{2+} up take, the maximum up take of Ni^{2+} increased to 62 %.

(IV) The removal of Zn^{2+} shows a very similar treat to those of Cu^{2+}, Ni^{2+}, and $-Cr_2O_7^{2-}$, but the percent adsorption of Zn^{2+} using polyurethane is much lower than those of the other metal ions. This is simply due to the fact that Zn^{2+} has lower tendency to form a complex compound with the active center of the resin.

Aim of investigation

The aim of this work is to study the removal of heavy metal ions from wastewater of electroplating process using natural clay and polyurethane as cation exchange resins to achieve removal of Zn^{2+},Cu^{2+},Ni^{2+} and $-Cr_2O_7^{2-}$ ions.

The study was done on an authentic solution of $CuSO_4$, $ZnSO_4$, $NiCl_2$ and $K_2Cr_2O_7$, as well as on wastewater samples taking from Fresh company in 10^{th} Ramadan city.

The study comprised discussion of obtained results as well as a recommendation concerning wastewater treatment of electroplating processes to reduce pollutant, to the allowable limits of environmental laws.

By studying the effect of weight and time in acid medium, the application of polyurethane to treat an authentic mixture of Zn^{2+}, Cu^{2+}, Ni^{2+} and $-Cr_2O_7^{2-}$ ions, the order of removal of heavy metal ions is

$$-Cr_2O_7^{2-} > Ni^{2+} > Zn^{2+} > Cu^{2+}$$

The same experiment conditions were applied to the treatment of wastewater samples drained from fresh company for electroplating, the order of removal of heavy metal ions is:

$$-Cr_2O_7^{2-} > Ni^{2+} > Cu^{2+} > Zn^{2+}$$

The decreasing of total adsorption indicates that a competitions inhibition my occur by other cations in the solution with limited specify related to the ionic radii or tendency for complex formation.

By studying the effect of amount of clay on removal of heavy metal ions for 100 ml of solution atdifferent time with agitation speed 175 rpm.The results revealed that the increasing removal percent with increasing of weight of clay.

Therefore we should select the best weight and time to set the best result. But the application using clay to treat industrial wastewater samples of Fresh Company is difficult, as the presence of cyanide ions will interfere with adsorption of metal ions. Consequently cyanide ions must be treated by alkaline chlorination before using clay.

Also for complete removal of total chromium, a reduction of $-Cr_2O_7^{2-}$ should be accomplished by adding about 0.05 gram of sodium meta bisulfite/100 ml of $-Cr_2O_7^{2-}$ solution before adding clay.

The heavy metal cations adsorption by clay after treatment of cyanide ion and $-Cr_2O_7^{2-}$ ions in the order,

English summary

This thesis is concerned with the study of the removal of Zn^{2+}, Cu^{2+}, Ni^{2+} and $-Cr_2O_7^{2-}$ ions from wastewater samples of electroplating process.

The study comprised firstly on the method of preparation of polyurethane resins and defines its structure by IR and NMR spectra.

Secondly treatment of wastewater samples using polyurethane as an exchange resin and natural clay to remove heavy metal ions from single ion solution as well as from a mixture of them, also from individual wastewater samples from Fresh company in 10^{th} Ramadan city.

The results of the study the effect of amount of polyurethane for 100 ml of solution at different time with agitation speed 400 rpm showed that:

(I) In case of Cu^{2+}, an increase in amount of polyurethane leads to an increase in the percent adsorption of Cu^{2+} up to 73 % using 15 g /3h.

(II) Where a maximum adsorption of $-Cr_2O_7^{2-}$ ions (91.9 %) was obtained on using 15 / 3h, compared with only 52 % on using the resin in neutral form, this is explained in the light of keto-enol tautomerism phenomen taking place in polyurethane.

(III) An increase the amount of resin from 7-30 g show a steady increase in the Ni^{2+} up take, the maximum up take of Ni^{2+} increased to 62 %.

(IV) The removal of Zn^{2+} shows a very similar treat to those of Cu^{2+}, Ni^{2+}, and $-Cr_2O_7^{2-}$, but the percent adsorption of Zn^{2+} using polyurethane is much lower than those of the other metal ions. This is simply due to the fact that Zn^{2+} has lower tendency to form a complex compound with the active center of the resin.