## 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.

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,