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ИССЛЕДОВАНИЕ ЭФФЕКТА ДОБАВЛЕНИЯ СЛОЖНЫХ ФАКТОРОВ НА ХАРАКТЕРИСТИКИ И ПОВЕДЕНИЕ ГАЛЬВАНИЧЕСКОГО ХРОМА (III)

Аннотация: *В статье рассматриваются, хромирование было использовано на железной руде. Мы изучили влияние добавления мочевины (NH2)2C=O], способной образовывать комплекс с ионом хрома (Cr+3) с формиатом, на характеристики слоя покрыти*

Ключевые слова: Хром, гальваника, мочевина, формиат, соотношение связей

Abstract:*In This Research The Electroplating Method of Chromium was Used on iron ore (steel).We studied the effect of addition of urea $(NH_2)_2C=O]$ capable of complex formation with chromium ion (Cr^{+3}) with the formate on the coating* ***layer*** specifications.

Keywords: Chromium, electroplating, urea, formate, bond ratio

Introduction: We know that if we can slow down the process of metal return on the surface of the drip we will get a coating layer of good specifications because when the sedimentation ratio is large, some of the atoms will not be able to spread and distribution on the surface of the substrate in a timely manner and the kinetic energy of the atoms are higher than Lead to defects and damage to the coating layer**.[1]**It also

increases the speed of the growth of mineral crystals on the surface of the meser, resulting in large crystals and rough on the surface and shows paint dark.**[2]**

To slow the sedimentation process, it is necessary to make it more difficult to return the metal to the surface of the probe by trying to make the ion of the metal ion drift towards the more negative values that require greater electrical energy. [3]

We selected urea formula:

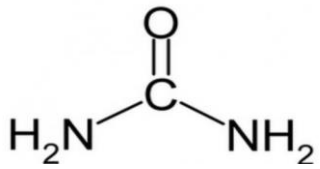


Figure 1: Chemical formula of urea

1. Urea is a good complex agent for many metal ions and many transition minerals **[3]**.

2. Urea has many pharmaceutical, agricultural and industrial uses **[4] [3].**

3. Carbamide solutions are non-toxic **[5].**

2) Research Objective:Study the effect of addition of complex factors capable of forming complexes with chromium ion to be used in the process of electrochemical deposition of chromium metal to obtain a good coating layer specification starting from the solutions of the hydro-chromium triplex

3) Experimental:

 pH method & Electrical conductivity measurement method of solution: [6] We prepared (500 mL) of the three chromium chloride salts at a concentration of 0.1 M and attended 500 mL of urea ions at 0.1 M concentration. We then took specific volumes of both solvents and mixed them, so that we obtained specific ratios between the two volumes. The total size is constant, then the pH and measuring the electrical conductivity of the mixture..

Study the effect of adding the complex agent on chromium return latency:We prepared four bottles of capacity (100 ml) for each flask.All the

previous solutions were prepared with a dual distillation water on the background of KCl solution at 0.5 M concentration. We then determined the chromium return latency by returning it to a pathway of mercury in the device Polarographic analysis and ring curve design.

- Chromium plating of chromium from complex urea solution:

We performed the chromium plating process with the presence of complex chromium enamels on iron bars.

We prepared five solutions of $CrCl_3.6H_2O$ (25 ml) and concentration (0.1 M) per solution and then added 75 mL of urea to each of the previous solutions.

4) Results and Discussion:

Table (1): Study the correlation ratio between chromium ion (Cr^{+3}) and urea content in a manner that changes pH

VmL(Cr^{+3})	**VmL[$(NH_2)_2C_2O_2$]**	**pH**	**Electric conductivity (ms)**
0	100	11.88	11.90
100	0	3.6	17.2
90	10	3.7	16.2
80	20	3.90	15.2
70	30	4.20	14.2
60	40	4.35	13.2
50	50	4.51	12
40	60	4.60	10
30	70	4.1	6.2
20	80	4.03	5.2
10	90	9.5	8

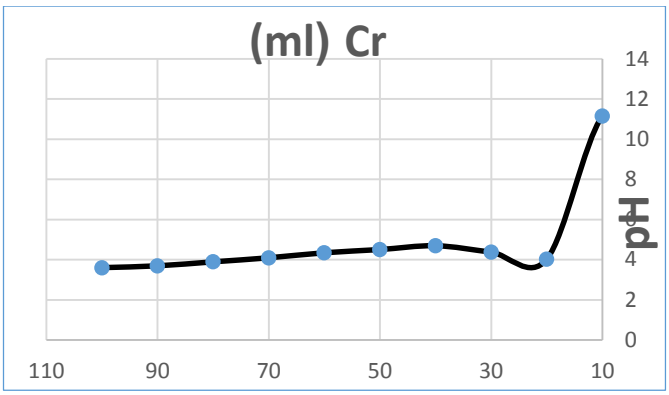


Figure 2: Determination of the correlation ratio in the method complex[$Cr(C_2H_4N_2O_2)_3$] in a pH solution

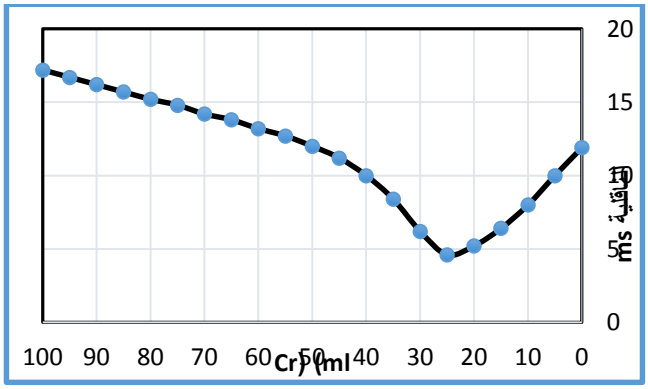


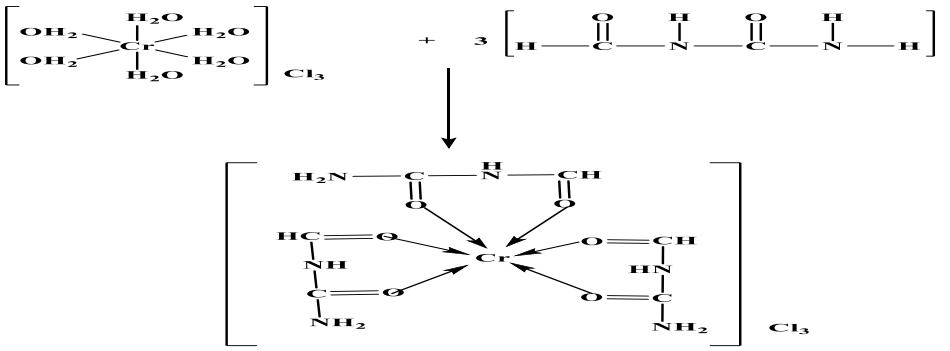
Figure 3: Determination of the correlation ratio in the complex [$Cr(C_2H_4N_2O_2)_3$] in the electric conductivity method

Interpreting the results: Figure (2) shows how the pH changes in terms of the change in the composition of the solution. The solutions of the studied compounds have an initial pH of (3.6) for the triple chromium chloride and (11.8) for the urea urea. The chromium(III) chloride solution is acidic, which means that the mixture of the two solutions is a formula (acid-base), that mixing the solutions of these compounds will result in the adjustment of the pH. From the figure, it is observed that the pH of the mixture slowly increases until it reaches a specified value that decreases the pH value when the correlation ratio (1:3) starts and then rises.

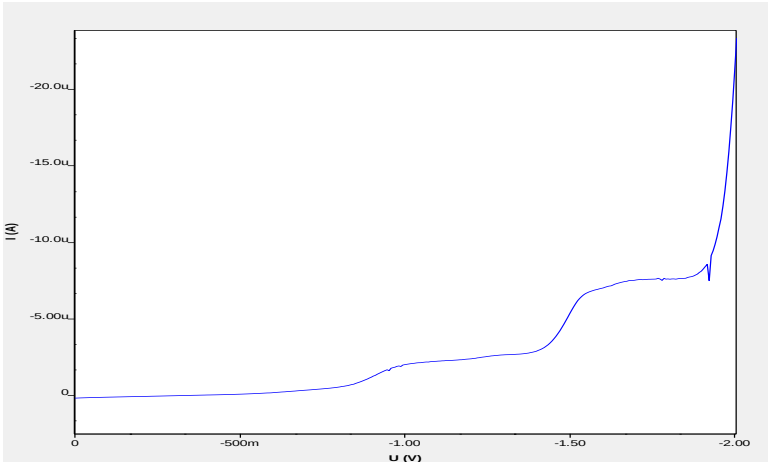
Figure 3 shows that the electric conductivity was high before starting the addition of organic matter. At the beginning of the addition of urea, we observe a decrease in the electrical conductivity of the mixture. This is due to the entry of the ions carrying the electric current into the complex shape. This indicates that the

largest possible amount of composite ions $(NH_2)_2C_2O_2$ and $(CrCl_3.6H_2O)$ have entered the complex formation, which corresponds to the correlation ratio (1:3) and then begins to increase.

By studying the correlation between chromium ion (Cr^{+3}) and urea in the complex in both pH and electric conductivity, therefore we can propose the equation of the interaction between the two compounds



The Polarographic Method:



Fig(4): The return of the chromium($1*10^{-3}$ M)on the droplets of mercury in 0.5 M KCl

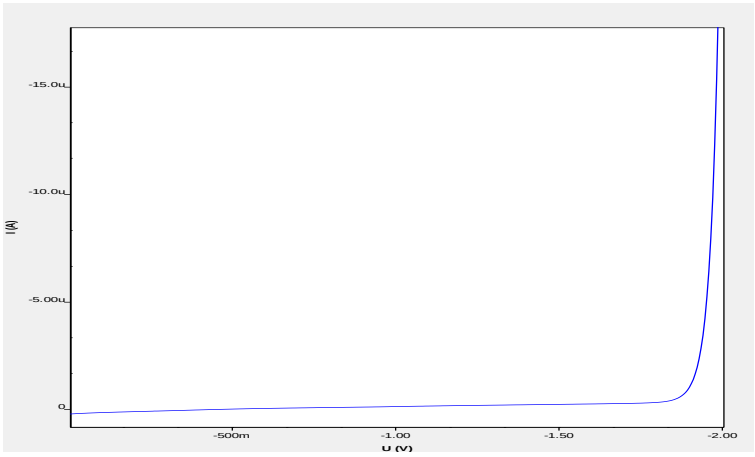
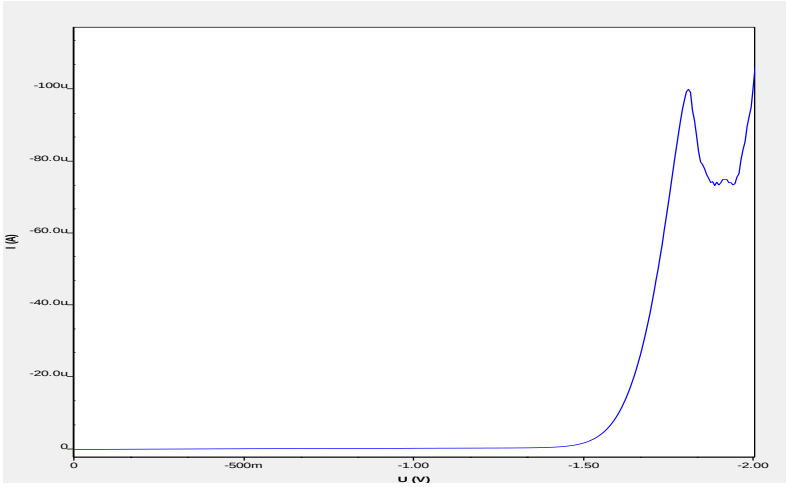
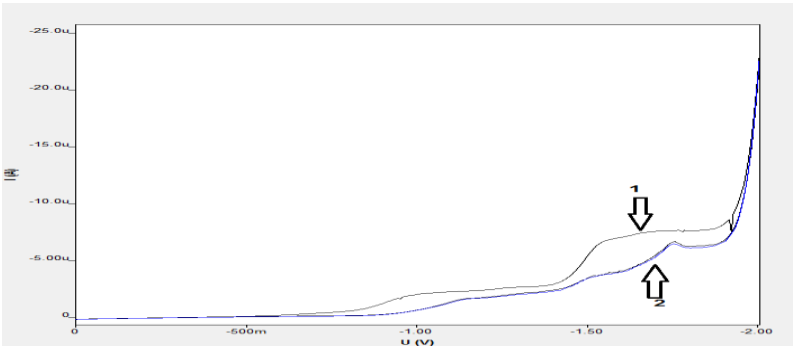


Figure (5): Returns of urea ($3*10^{-3}$ M) on the droplets of mercury in KCl (0.5 M)



Figure(6): Returns of sodium formate ($3*10^{-3}$ M) on mercury droplets in KCl (0.5 M)



Fig(7): Return of a solution from urea formate with chromium(2)at the correlation ratio(1:3)compared to the return of chromium(1)on mercury droplets in 0.5 M KCl

From the previous curves we note the following:

The appearance of two waves on the graphs showing that the chromium ions (Cr^{+3}) are based on the mercury trajectory of the train in two phases according to the equations:

$$Cr\ (III) + e^- \rightarrow Cr\ (II)$$

$$Cr\ (II) + 2e^- \rightarrow Cr\ (0)$$

Urea did not give any indication on the pologram, and the ants gave a large peak close to the release of hydrogen

In the combination of urea and chromium ions, we observed a shift in the half-wave latency of the chromium towards the most negative values, which confirms the entry of chromium ions in the complex form.

- Chroumium plating:

Table 3: Study of chromium plating of chromium from a complex chromium chloride solution with urea-formate

the ingredients	$CrCl_3.6H_2O$		**$[(NH_2)_2C_2O_2]$**		
(pH)	1.5 – 2				
Current intensity (mA)	10	20	30	40	50
Current density (mA/Cm^2)	1.6	3.18	4.7	6.3	8
Difference latency (V)	0.6	0.8	1	1.2	1.3
The weight of the (g) deposited metal	0.0014	0.0029	0.0044	0.0056	0.0076
(nm) Thickness	310	642.3	974.5	1240.3	1683.2
(%) Return	43.34	45.31	45.83	46.66	47.5
the description	Bad coverage	Medium quality	Excellent smooth shiny good coverage	Good	Less softness

Discussion of results: In the previous table, we examined the effect of chromium electroplating process on the presence of urea ions as a complex factor on the quality of the resulting coating and note that the best result obtained was at a current density of 4.7 mA / cm^2. We obtained a coating layer with excellent specifications in terms of stability, adhesion, smoothness and excellent coverage. Gloss.

The significant improvement observed in the addition of the complex factor is explained by the fact that the entry of chromium ions in the complex form led to the chromium shift to return to the most negative values. This means that it is more difficult to extract the metal from the complex ion and return it to the surface of the precipitate. Allows the atoms of the metal to be distributed regularly on the surface of the tube.

The improvement of stability and adhesion indicates that the speed of chromium ions deposited on the surface of the precipitate was sufficient to cause adequate adsorption on the surface of the syringe and stick to it well.

Softness of coating and luster due to decreased size of granulated granules and good crystallization of chromium atoms on the surface of the precipitate

Fig. (8): Cast iron with a layer of chroumium

Conclusions:1 - The measurement of the pH - metric and measure the electrical conductivity that urea is complex with chromium with the presence of enzymes by the ratio of (1: 3)

2. The electrochemical study of the mercury pathway (the polarographic method) matches the results of the physical-chemical analysis with the results of the electrochemical analysis. The solution that can be used in the chromium plating process is the urea content at the ratio of 1:

3 - Get a coating layer with excellent specifications in terms of smoothness, adhesion, and luster when using urea additives as additives to the chrome plating basin.

References

1) Po-Yu Chena, Ming-Jay Dengb, Ding-Xuan Zhuanga, Electrochemical codeposition of copper and manganese from room-temperature N-butyl-N-methylpyrrolidinium bis (trifluoromethylsulfonyl) imide ionic liquid . Electrochimica Acta 54 (2009) 6935–6940

2) ZHANG Bo, WU Wenyuan, YIN Shaohua, LI Shiwei, LUO Yao BIAN Xue, TU Ganfeng, Process optimization of electroless copper plating and its influence on electrochemical properties of AB5-type hydrogen storage alloy, JOURNAL OF RARE EARTHS, Vol. 28, No. 6, Dec. 2010, p. 922.

3) J.L. Ortiz-Aparicio, Y. Meas, G. Trejo, R. Ortega, T.W. Chapmana, E. Chainet, P. Ozil, Electrodeposition of zinc–cobalt alloy from a complexing alkaline glycinate bath, Electrochimica Acta 52 (2007) 4742–4751.

4) ADEL S. MEGAHED, OMAR B. IBRAHIM, ABDEL MAJID A. ADAM and M. M. AL-MAJTHOUB, SYNTHESIS AND STRUCTURAL CHARACTERIZATION OF UREA METAL COMPLEXES WITH Cu(II), Zn(II) , Ag(I), Cd(II) AND Hg(II) IONS AT HIGH TEMPERATURE, Int. J. Chem. Sci.: 12(2), 2014, 335-343 ISSN 0972-768X

5) U. Pramod Kumar* and C. Joseph Kennady,Characterization of Chromium Electrodeposits Obtained From Trivalent Electrolytes Containing Formaldehyde as Additive, Int. J. Thin. Fil. Sci. Tec. 4, No. 2, 147-153 (2015)

6) Dr. Bakir, Dr. M. P. Sheikh, Study of wholesale Solutions(acidosis-TUTEAA(II)–water)and use them in the alluvial coating. Journal of Al-Baath University, vol. 23, No. 5,2001