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ELECTROCHEMICAL DEPOSITION OF SILVER IN PRESENTS OF THIOURIA

Abstract: *In this research, the electroplating method was used silver on copper ores, which is one of the methods of coating by forming a cover on the surface by using*

silver salts as a source of silver and potassium nitrate as a catalyst source and in the presence of thiourea as an improved material for coating.

Thiourea is able to form a complex with a silver ion with a correlation ratio (1: 1), and the correlation ratios for the formation of a complex have been determined from the two reaction materials in several methods: the pH solution measurement method, the electrical conductivity measurement method, and the spectral method.

Keywords: *Electrochemical Deposition, silver, thiouria.*

ЭЛЕКТРОХИМИЧЕСКОЕ ОСАЖДЕНИЕ СЕРЕБРА В ПРИСУТСТВИИ ТИОМОЧЕВИНЫ

Аннотация: *В этом исследовании методом гальванического покрытия было использовано серебро на медных рудах, которое является одним из методов нанесения покрытия путем формирования покрытия на поверхности с использованием солей серебра в качестве источника серебра и нитрата калия в качестве источника катализатора и в присутствии тиомочевина как улучшенный материал для нанесения покрытий.*

Тиомочевина способна образовывать комплекс с ионом серебра с коэффициентом корреляции (1:1), и коэффициенты корреляции для образования комплекса были определены из двух реакционных материалов несколькими способами: методом измерения pH раствора, метод измерения электропроводности и спектральный метод

Ключевые слова: *Электрохимическое осаждение, серебро, тиомия.*

1. Introduction

The main goal of most research related to the study of galvanic coating of various minerals is primarily economic, and related to finding suitable barriers to mineral corrosion factors in mineral installations such as rust. .

For this reason, the researchers have rushed in recent years to study and find different methods and methods to improve the specifications of galvanic coatings of minerals

with the aim of increasing their ability to persist and adhesion and resist corrosion factors, on the one hand, and on the other hand, Means the process of precipitation (plating) a thin layer of a metal metal that has a certain electrical charge, an electrolytic solution passes into the electrolyte an electric current whose potential is equal to the potential of returning the required ion Its sedimentation [1].

Through this research, we aim to improve the quality of silver plating by using non-toxic and low-cost materials in a plating cell such as thiourea [2-5]

Thiourea is a good complex agent for many mineral ions and is also non-toxic and its waste is easily treated and does not cause corrosion. In order to study the effect of the silver thiourea complex on the galvanic coating process and the specifications of the resulting coating layer, it is necessary to study the binding rate in the thiourea silver complex [6-8]

2. Experimental:

2.1. Materials:

Laboratory Glassware: beakers, Erlenmeyer flasks of different capacities, standard pipette, a scale. The physiochemical study was conducted using the measure of pH and conductivity in order to identify the concentration of Hydrogen ions and to examine the electric conductivity. The following materials were used:

Silver nitrate, thiouria and distilled water.

- The electric reduction of silver was studied using Volt-amperemeter station, An electric supplier.

3. Results and Discussion:

To identify the bonding ratio between silver ion and thiouria, the changes in the solutions pH were examined as a method of physiochemical analysis. We prepared 20 ml of Silver nitrate with concentration of (2×10^{-3}) M. We also prepared 50 ml of thiouria with the same concentration (2×10^{-3}) M and the We also titrated Silver nitrate solution by adding thiouria in batches, the results were represented graphically as follows:

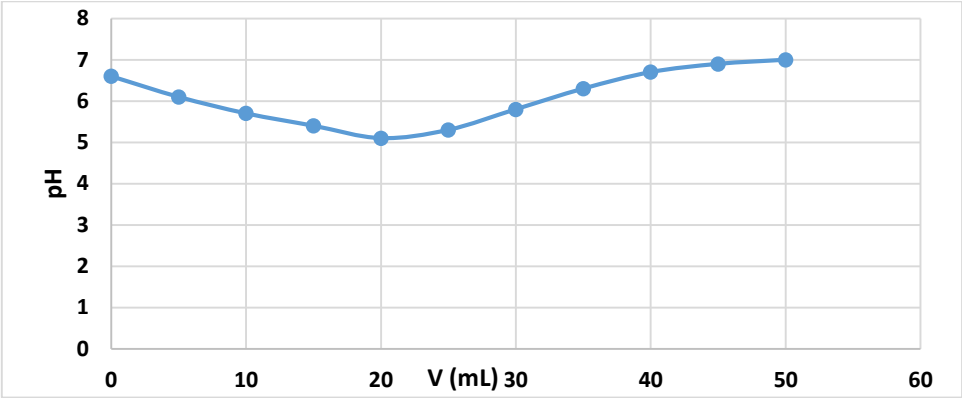

Figure (1): Change of the solution pH of the system [thiouria – Silver– water] in terms of the volume of thiouria added as [Thiouria]=[Ag]=(2 × 10^{-3})*M*.

Mixing the silver nitrate solution with the thiourea solution leads to a decrease in the pH value as silver ions (Ag^+) displace the hydrogen ions (H^+) and replace them. This leads to acidification of the solution (increased concentration of H^+ and a decrease in the value of pH) and this decrease continues until the percentage of components The solution is (20%) silver nitrate and (20%) thiourea, i.e. at the binding rate (1:1) where the value of pH of the solution is equal to (5.1).

Study the correlation ratio using the electrical conductivity method:

the changes in the electrical conductivity were examined as a method of physio-chemical analysis.

We also titrated Silver nitrate solution by adding thiouria in batches, the results were represented graphically as follows:

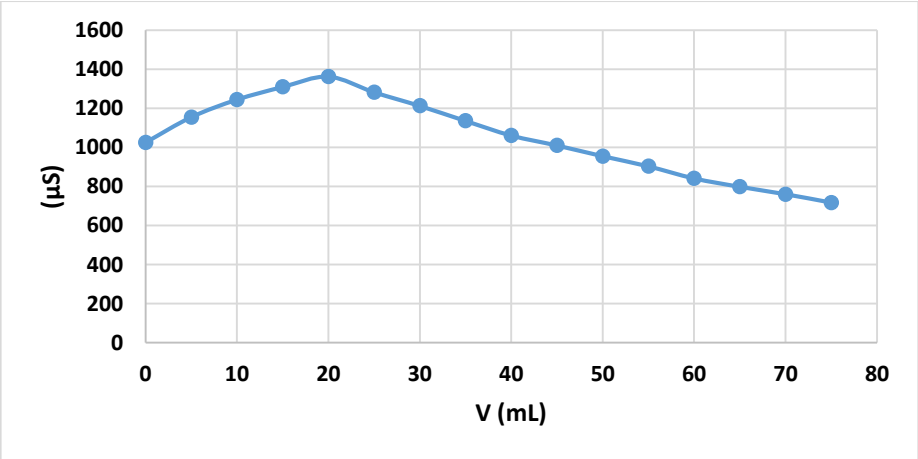

Figure (2): Change of the solution electrical conductivity of the system [thiouria – Silver– water] in terms of the volume of thiouria added as [Thiouria]=[Ag]=(2 × 10^{-3})*M*

We note that the electrical conductivity was low before adding thiourea, and when starting adding the thiourea solution we notice an increase in the electrical conductivity of the mixture until we reach a point indicating that the largest possible amount of the two compounds (NH2CSNH2) and (AgNO3) have entered into the formation of the complex and this point corresponds to the link (1:1)

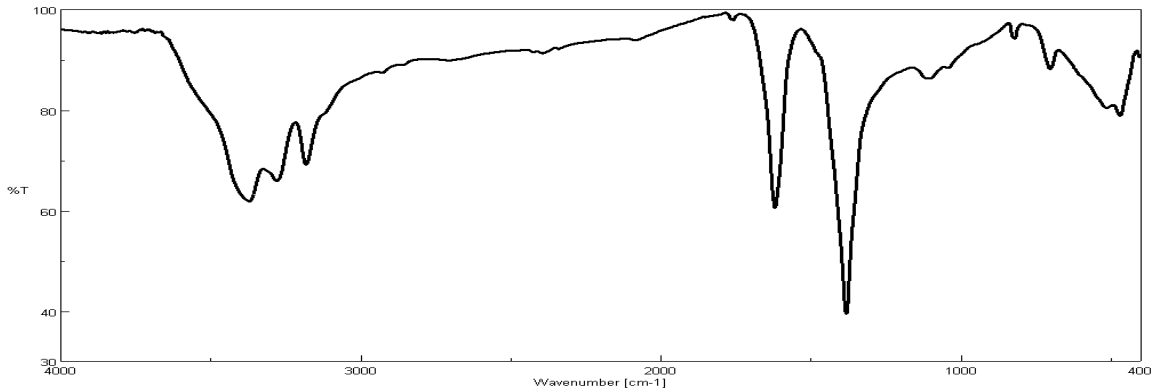

Figure (3) IR spectrum of the silver complex with thiourea correlation (1: 1)

Painting procedure:

We conducted the study on three solutions of silver nitrate, and thiourea was added in different concentrations (0.001, 0.01, 0.1 M) and at different current strengths (20, 30, 40 mA) respectively. The coating was made with a volume (100 mL) and the catalyst potassium nitrate was added with a concentration (0.06 M) All solutions were prepared with two distillate water taking into account the distance between the two tracks (4 cm).

Components	$AgNO_3$	KNO_3	NH_2-CS-NH_2
C (M)	0.02	0.06	0.1
Volume (mL)	100		
Time (min)	20		
Temperature (° C)	25		
pH	5.3		
Electric conductivity (ms)	9.37		
Current intensity (mA)	20	30	40
Current density (mA / Cm^2)	2.2	3.3	4.4
Amount of electricity (C)	24	36	48

Weight of precipitated metal (gr)	0.0132	0.0260	0.0337
Thickness (nm)	1398	2777	3600
(%) Yield	49.25	64.67	62.87

4. Conclusion:

the electroplating method was used silver on copper ores, which is one of the methods of coating by forming a cover on the surface by using silver salts as a source of silver and potassium nitrate as a catalyst source and in the presence of thiourea as an improved material for coating.

Thiourea is able to form a complex with a silver ion with a correlation ratio (1: 1), and the correlation ratios for the formation of a complex have been determined from the two reaction materials in several methods: the pH solution measurement method, the electrical conductivity measurement method, and the spectral method.

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