AinShamsUniversity
Faculty of Girls, Arts,
Science and Educationn
Cairo, Egypt

Electrochemical behavior of Aluminum coated with different alloys by electroless deposition

A Thesis

Submitted for degree of Science (Physical Chemistry)

Faculty of Girls for Arts, Science & Education

Ain Shams University

Presented by

Marwa mohammed mohammed mohammed esmail

Cairo, 2015

AinShamsUniversity
Faculty of Girls for Arts, Science and Education

Electrochemical behavior of Aluminum coated with different alloys by electroless deposition

BY

Marwa mohammed mohammed mohammed esmail

A Thesis

Submitted for degree of Science (Physical Chemistry)

Faculty of Girls for Arts, Science & Education

Ain Shams University

Supervisors by

Approval

Dr. Ensherah Abd El-Wahab
Assistant Prof. of physical chemistry
Faculty of Girls, Arts, Science and Education.
Ain ShamsUniversity, Egypt.

Dr. Aisha Kassab Abd elaziz
Assistant Prof. of physical chemistry
Faculty of Girls, Arts, Science and Education.
Ain Shams University Egypt.

Dr:Omyma Ramadan Mohammed
Assistant Prof. of physical chemistry
Faculty of Girls, Arts, Science and Education.
Ain Shams University, Egypt.

AinShamsUniversity
Faculty of Girls for Arts, Science and Education

Student Name: marwa mohammed mohammed .

ScientificDegree:. (physical chemistry).

Department: Chemistry.

Name of Faculty: Faculty of Girls for Arts, Science & Education.

University: Ain Shams.

B. Sc. Graduation Date: May 2012

جامعه عين شمس
كلية البنات للأداب والعلوم والتربيه

السلوك الكهروكيميائى لشرائح الالومنيوم المغطاة بسبائك مختلفة عن طريق الطلاء اللاكهربى

رساله مقدمه الي

قسم الكيمياء

كليه البنات- جامعه عين شمس

من

مروة محمد محمد محمد اسماعيل

للحصول علي

درجه الماجستير فى الكيمياء (كيمياء فيزيائيه)

تحت اشراف

د/ انشراح عبد الوهاب
أستاذ مساعد الكيمياء الفيزيائية
كلية البنات - جامعة عين شمس

د/ عائشة كساب عبدالعزيز
أستاذ مساعد الكيمياء الفيزيائية
كلية البنات - جامعة عين شمس

د/ أميمة رمضان محمد
أستاذ مساعد الكيمياء الفيزيائية
كلية البنات - جامعة عين شمس

2015

جامعه عين شمس
كلية البنات للأداب والعلوم والتربيه

اسم الطالبه : مروة محمد محمد محمد اسماعيل.

عنوان الرساله: السلوك الكهروكيميائى لشرائح الالومنيوم المغطاة بسبائك مختلفة عن طريق الطلاء اللاكهربى.

الدرجه: درجه الماجستير فى الكيمياء فيزيائيه.

لجنه الأشراف

د/ انشراح عبد الوهاب	د/ عائشة كساب عبدالعزيز	د/ أميمة رمضان محمد
أستاذ مساعد الكيمياء الفيزيائية	أستاذ مساعد الكيمياء الفيزيائية	أستاذ مساعد الكيمياء الفيزيائية
كلية البنات - جامعة عين شمس	كلية البنات - جامعة عين شمس	كلية البنات - جامعة عين شمس

2015

جامعه عين شمس
كليه البنات للأداب والعلوم والتربيه

اسم الطالبه: مروة محمد محمد محمد اسماعيل

الدرجه العلميه: معيد

القسم: الكيمياء

الكليه: كليه البنات للأداب والعلوم والتربيه

الجامعه: عين شمس

ACKNOWLEDGEMENT

Thanks GOD

My deepest gratitude and appreciation to, ***Dr. Ensherah Abd El-Wahab***, Assistant Professor of physical Chemistry, College for Girls, Arts, Science and Education, Ain Shams University, for her deep concern in this work, support, directs supervision and valuable guidance throughout the whole work.

I am extremely fortune to work under supervision of ***Dr. Omyma Ramadan Mohamed,*** Assistant Professor of Physical Chemistry, University College for Girls, Ain Shams University, I shall always be grateful for her supervision, guidance, constant encouragement and abundant patience. I do not think that I can ever thank her enough for all her support throughout the work.

I would like to thank **Dr.** ***Aisha kasab,*** Assistant Professor of Physical Chemistry, University College for Girls, Ain Shams University, for their guidance and support during the beginning of this work.

The author wishes to express her thanks to head of the chemistry department, Faculty of girls, Ain Shams University, for providing the facilities needed throughout the research work.

A special deep thanks to the staff members electrochemistry for their support during the execution of this work

I am extremely thankful to ***Dr. Madeha Ahmed Shoeib,*** Prof. of Physical Chemistry, Surface Coating Department, Central Metallurgical Research and Development Institute (CMRDI).

Special thanks for **Dr. samia mokhtar** Professor of Physical Chemistry, University College for Girls, Ain Shams University for helping me.

Lastly, many thanks also to **my mother** and **my father**. At difficult times, they offered me great help and encouragement. At good time, they shared my happiness.

Marwa Mohammed

Aim of the work

One of the most important functions of deposited coatings is to provide protection against corrosion of industrial machinery and plant are major sources of loss in a national economy. Not only do they reduce the life of such equipment and increase the amounts of down-time, but, they do also have implication in terms of maintenance casts and expenditure on replacement parts. The alternative strategy to avoid the use of low-cost materials of construction is not only expensive but can also involve materials which are less easy to work.

Aluminum alloys possess high mechanical strength, excellent thermal and electrical conductance, good reflectivity and low working cost.

Since such problem of corrosion occur at the surface, only by surface treatment can they be reduced or eliminated. This is where the deposition of metallic coatings from aqueous media offers practical solutions, such coating being capable of deposition at useful thickness and with defined properties appropriate to the problem.

Electroless nickel (EN) plating is used to deposit nickel without the use of an electric current.

Although a variety of metals can be electrolessly plated, electroless Ni-P coating has received widespread acceptance as it provides high hardness and excellent resistance corrosion. Electroless Ni-P coatings are widely used for corrosion protection application in a variety of environment. It is a barrier coating, protecting the substance by sealing it off from the corrosive environment, rather than by sacrificial.

Development of electroless nickel alloy deposits is considered as the most effective method to alter the chemical and physical properties of binary Ni-P alloy and ternary Ni-Sn-P alloy deposit. The choice of the additional element is made based on the chemical, physical propriety to be imparted in the deposit.

The aim of the present work is to study the properties of electroless plating coatings Ni-P and Ni-Sn-P (with two different concentrations of tin chloride 0.1g/l and 1g/l) alloys. The electrochemical corrosion behavior of substrate, electroless Ni–P and Ni-Sn-P alloys were examined. The solutions used for testing the corrosion protection are 3.5%NaCl, 0.1N HCl and a 0.1N NaOH solution, on aluminum substrate was investigated by electrochemical methods.

Also study the effect of heat treatment on microstructure of these coating.

CONTENTS

List of Tables