FORMATION AND CHARACTERIZATION OF NANO OXIDE FILM OF Al (Mg-Cu) ALLOY

BY

Eng. Heba Mageed Emam El-Fares

A Thesis Submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfillment of the
Requirements for the Degree of
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In
Metallurgical Engineering

Faculty of Engineering, Cairo University

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Under the Supervision of:

Prof. Dr. Saad Megahed El-Raghy Main Advisor
Mining, Petroleum and Metallurgical Engineering Department,
Faculty of Engineering, Cairo University

Prof. Dr. Randa Mohamed Abdel-Karim Advisor
Mining, Petroleum and Metallurgical Engineering Department,
Faculty of Engineering, Cairo University

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Approved by the
Examining Committee:

Prof. Dr. Saad Megahed El-Raghy — Main Supervisor
Mining, Petroleum and Metallurgical Engineering Department,
Faculty of Engineering, Cairo University

Prof. Dr. Randa Mohamed Abdel-Karim — Supervisor
Mining, Petroleum and Metallurgical Engineering Department,
Faculty of Engineering, Cairo University

Prof. Dr. Fawzy Abdel- kader El-Refaie — Examiner
Mining, Petroleum and Metallurgical Engineering Department,
Faculty of Engineering, Cairo University

Prof. Dr. Madiha Ahmed Shoaeeb — Examiner
Professor at Central Metallurgical Research

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2015

Engineer: Heba Mageed Emam El-Fares
Date of Birth: 14/5/1989
Nationality: Egyptian
E-mail: hebamageed@yahoo.com
Phone: +201010916978
Address: 24 first quarter , EL –sheikh zayed Cairo, Egypt
Registration Date: 1/10/2011
Awarding Date: / /
Degree: MASTER OF SCIENCE
Department: Mining, Petroleum and Metallurgy Engineering
Supervisors: Prof. Dr. Saad Megahed El-Raghy
Prof. Dr. Randa Mohamed Abdel-karim
Examiners:
Prof. Dr. Saad Megahed El-Raghy
Prof. Dr. Randa Mohamed Abdel-karim
Prof. Dr. Fawzy Abdel –Kader Elrefaie
Prof. Dr. Madiha Ahmed Shoaeeb (Central Metallurgical Research)

Title of Thesis:

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Key Words: Nanostructures, Electrodeposition, AL(Mg-Cu) alloy, Corrosion, Anodizing

Summary

The effect of voltage and concentration of electrolyte on the structure of porous anodic alumina (PAA), via electrochemical anodizing of aluminum alloy was studied. The weight change, roughness and corrosion rate were measured. Nano porous anodic alumina templates are fabricated following the one-step anodizing at room temperature, (5, 10,20 and 40) volt and (5%, 15% and 30%) concentration (H_3PO_4) . Formation of barrier oxide layer in 5% concentration at (5 and 10) volt and the porous oxide layer was formed at another conditions. When the anodizing voltage increases the roughness and the corrosion rate increases.

Acknowledgments

I have worked with a great number of people whose contribution in assorted ways to The research and the making of the thesis deserved special mention. It is a pleasure to Thank those who made this thesis possible.

Foremost I offer my sincerest gratitude to Prof. Dr. Saad El-Raghy, Metallurgical Engineering Dept, Faculty of Engineering, Cairo University for his guidance, patience And support. I consider myself very fortunate for being able to work with a very Considerate and encouraging professor like him. And also, I would like to thank him For his detailed and constructive comments, and for his important support throughout This work. In addition, he was always accessible and willing to help his students with Their researches.

I owe my deepest gratitude to my advisor Prof. Dr. Randa Abdel-Karim, Metallurgical Engineering Dept, Faculty of Engineering, Cairo University who has supported me throughout my thesis with her patience, motivation, enthusiasm, and immense knowledge. Her guidance helped me in all the time of research and writing of this thesis. I attribute the level of my Master degree to her encouragements and efforts and without her this thesis would not have been completed or written.

I would like to thank Prof. Dr. Hafez Ahmed, Metallurgical Engineering Dept., Faculty of Engineering, and Cairo University for the continuous support and encouragement.

I would especially like to thank engineers, technicians, and committee staff in Metallurgical Engineering Department at Cairo University.

I would like thank to Dr. Ashraf Kamal, who helped me during the sample Preparation and electrodeposition of samples and Eng.Aliaa abd Elfatah, who helped me during samples of corrosion.

A special thanks to my family. Words cannot express how Iam grateful to my mother ,my father and my husband Eng.Hussein for all of the sacrifices that they have made on my behalf. Their prayer for me was what sustained me thus far.

I would also like to thank all of my friends who supported me, and incented me to strive towards my goal.

At the end I offer my regards and blessings to all of those who supported me in any respect concerning this work.

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Abstract

The effect of Al (Mg-Cu) alloy on anodizing process under various operating conditions (voltage and phosphoric acid concentration) at constant time and temperature was studied.

The objective of the present work is to study anodizing and characterization of nano porous aluminum oxide films on aluminum alloy substrate.

Nano porous anodic alumina templates are fabricated following the one-step anodizing at room temperature, (5, 10, 20 and 40) volts and (5%, 15% and 30%) concentration. The acid used for fabricated these nano porous anodic alumina templates is phosphoric (H_3PO_4).

The effect of voltage and concentration of electrolyte on the structure of nano porous anodic alumina (PAA), via electrochemical anodizing of aluminum alloy were studied. Morphology of the PAA was characterized by scanning electron microscopy (SEM). The pore diameter and weight change of the specimen before and after anodizing process were measured. The average pore diameters increased with increasing anodizing voltage as well as acid concentration. The weight change after anodizing reflected the nature of formed layer. There was weight gain in case of barrier oxide layer and weight loss in case of porous oxide layer.

Roughness values are directly proportional to anodizing voltage and acid concentration.

The corrosion behavior was deliberated by using potentiodynamic test using 0.1 M NaCl solution. When the anodizing voltage increases the corrosion rate increases.

In general formation of barrier oxide layer in 5% concentration at (5 and 10) volts .The porous oxide layer was formed at another conditions .

Chapter One

Introduction