

**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
MASTER OF SCIENCE
In
Metallurgical Engineering

Faculty of Engineering, Cairo University

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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.

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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