

Effect of Processing Parameters on Ageing Behavior And Microstructure of Nanoporous Oxide Film Growth On Aluminum In Sulphuric Acid Using A Two-Step Anodisation Process

L. Bouchama^{1*}, *N. Azzouz*¹, *N. Boukemouche*¹, *J.P. Chopart*²

¹ *Laboratory of the Interactions Materials-Environment (LIME), University of Jijel (Algeria).*

² *Laboratory for Analysis of Mechanical Constraints – Transfers to Interface Dynamics (LACM-DTI), University of Reims Champagne-Ardenne (French).*

E-mail : bouchmalamia@yahoo.fr

Abstract:

The anodising of aluminium has been investigated with the aim to realise nano-porous structures for use as nano-templates, as gas-sensor systems and as catalysis. A two-step anodisation process performed at 5 °C was used to prepare highly ordered porous anodic alumina on the Al-Mg alloy. The anodising of substrates was carried out in 0.5 and 1 M sulfuric acid baths at 23 and 25 V.

The influences of anodizing variables, such as applied voltage, sulfuric acid concentration and alloying elements on the microstructure and the average pore diameter of AAO were systematically investigated. The applied voltage, and sulfuric acid concentration were found to be the key factors affecting the pore diameter of AAO films in this study. The presence of alloying elements affects not only the rate of oxide growth but also the microstructure of the anodic film.

Anodised alumina samples were characterised with Scanning electron microscopy (SEM) and X-ray diffraction analysis to investigate the coating structure and microstructure. Ageing behaviour has been investigated in a 0.2M potassium sulphate solution, using electrochemical impedance spectroscopy (EIS). The XRD shown that no characteristic peak of Al₂O₃ found, indicates that amorphous phase was obtained on the film surface.

The SEM image of Anodic aluminum oxide shows the array of partially ordered nano-porous alumina, however further investigations are required to optimise the production of highly self-ordered porous structures. The EIS was found that the two -step anodization, an environmentally friendly coating method, could produce a high organization oxide coating with good ageing behavior for the Al – Mg alloy.