INFRARED SPECTROSCOPY OF OXIDE LAYERS PRODUCED BY ELECTROLYTIC PLASMA FROM DIFFERENT ALKALINE SOLUTIONS

Bruna T. M. Souza*, Rafael R. Lucas and Deborah C.R. Santos
[1]*LaPE – Laboratório de Plasma Eletrolítico, FATEC- Pindamonhangaba, SP, Brasil.*

1. Introduction

X-ray diffraction (XRD) spectroscopy is a technique widely employed to evaluation of chemical structure of ceramics, because it allows identify the phase composition of those crystalline materials, among other information. However, infrared spectroscopy can be useful for evaluation of chemical bonds present in the oxide structure. This work shows the infrared analysis performed in oxide layers deposited by plasma electrolytic oxidation from three different alkaline solutions.

2. Experimental

Plasma electrolytic oxidation was performed in a system fed by a DC power supply (0-1000 V). Samples of 5052 Al alloy were anodizing for 10 min, 400 V and temperature lower than 50 °C. Electrolytic solutions were prepared with deionized water, sodium silicate (Na_2SiO_3), sodium phosphate (Na_3PO_4), aluminum sulfate [$Al_2(SO_4)_3$] and sodium tetraborate ($Na_2B_4O_7$), according to table 1.

Tab.1 – Composition of electrolytic solution

Solution	Na_2SiO_3	Na_3PO_4	$Al_2(SO_4)_3$	$Na_2B_4O_7$
A	20 g/l	---	---	2.0 g/l
B	20 g/l	2.0 g/l	---	---
C	15 g/l	---	1.0 g/l	---

3. Results and Discussions

Fig. 1 shows the spectrum of 5052 Al alloy and the spectra of oxide layers deposited on Al samples. As can be seen, there is a small bond in the spectrum of Al alloy related to alumina layer, which is product of chemical reactions between Al ions and atmosphere oxygen. It is also observed that spectra of oxide layers present the same absorption bands: O-H stretching of adsorbed H_2O (3500-3000 cm^{-1} and 1650 cm^{-1}), Si-O-Si or Si-O-Al (1200-1000 cm^{-1}), and Al-O (1000 – 500 cm^{-1}) [1,2]. Therefore, the analysis shows that oxide layers present basically the same structure of alumina (Al_2O_3) containing silica, even different alkaline solution have been used to produce them.

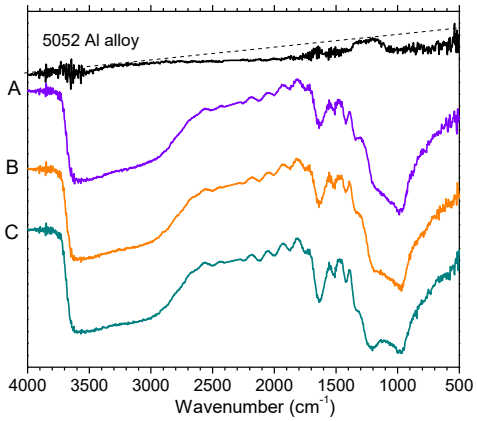

Fig. 1. *Infrared spectra of oxide layers deposited by plasma electrolytic oxidation on 5052 Al alloy*

4. References

[1] Antonio, C.A. Deposição de filmes finos por plasmas eletrolíticos em ligas de alumínio. 2011. 96 f. Dissertação (Mestrado) – UNESP – Faculdade de Ciências. 2011.
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*Corresponding author: bruna.souza253@etec.sp.gov.br