2262
doi:10.1017/S1431927622008698
Microsc. Microanal. 28 (Suppl 1), 2022

SEM Image Analysis on the Formation of Porous Anodic Alumina Templates

D. Levi Quiroz-Aguilera[1*], J. Ernesto Neri Cruz[1], Héctor A. Calderon[2] y Luz A. García Serrano[3].

[1] Instituto Politecnico Nacional, DNMN, Escuela Nacional de Ciencias Biológicas. CDMX, Mexico.
[2] Instituto Politecnico Nacional, Depto. Física, Escuela Superior de Física y Matemáticas. CDMX, Mexico.
[3] Instituto Politecnico Nacional, Depto. Sociedad y Política Ambiental, Centro Interdisciplinario de Investigación sobre Medio Ambiente y Desarrollo. CDMX, Mexico.
* Corresponding author: iqpquiroz@gmail.com

The use of porous anodic alumina templates (PAATs) has been extended nowadays since they allow the synthesis of highly ordered heterostructures with a controlled size for the study of behavior in nanometric orderings. The structural properties of the alumina template are the critical point in the synthesis of nanowires deposited on PAATs, since the correct morphology of the structures obtained depends on these. In this work, the goal is to optimize the morphology of PAATs, seeking to obtain the greatest homogeneity in the diameter of the pore, number of pores, as well as the greatest interpore distance, by controlling only with the influence of the voltage applied in the synthesis of the PAATs. The growth mechanism of PAATs synthesized on high purity aluminum plates (99.99%) is based on a modified two-step electrochemical anodizing method [1, 2]. This ca be carried out at different potentials. The PAATs have been characterized by X-Ray Diffraction (XRD) and Scanning Electron Microscopy (SEM)

The SEM image analysis is performed by using a microscopy image software on five images of different areas for each sample. The area of each pore was measured according to the pixels detected by the software. It is concluded that the best potential for the synthesis of PAATs is at 40 V since it provides the appropriate pore diameter for a nanometric structure (Dp = 48 nm prom.) and the rest of the structural properties are also adequate to guarantee the penetration of decorator nanoparticles between titania heterostructures and the homogeneity. It can be concluded that the electrical potential variable in the PAATs synthesis method is a critical variable, since the pore morphology depends on it. With the SEM microscopy we were able to verify that 40 Volts is a potential that allows us to have the greatest uniformity in the pores, as well as an interpore distance that will allow the easy adherence of the decorator particles in the subsequent synthesis process.

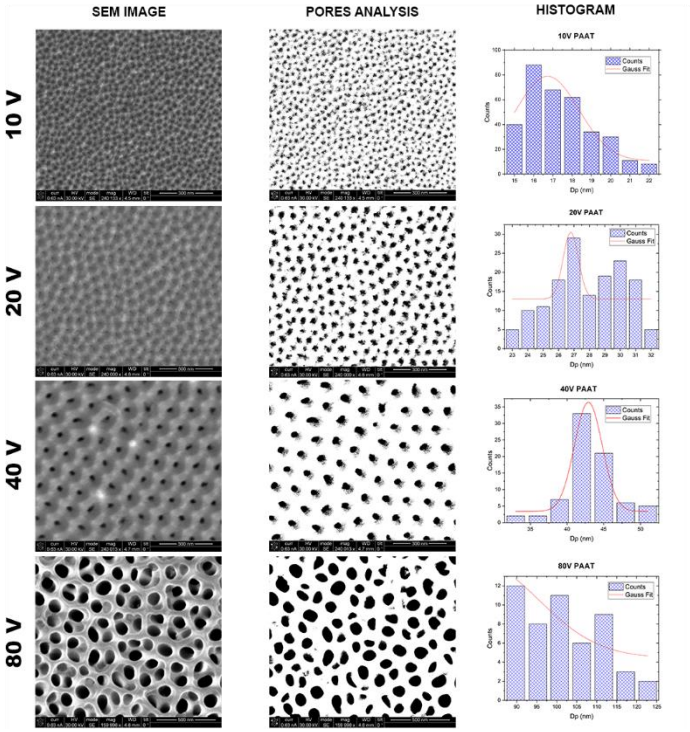

Figure 1. SEM images of each of the samples at the different voltages measured, followed by the image obtained for pore analysis and finally the histogram of frequencies with Gaussian distribution.

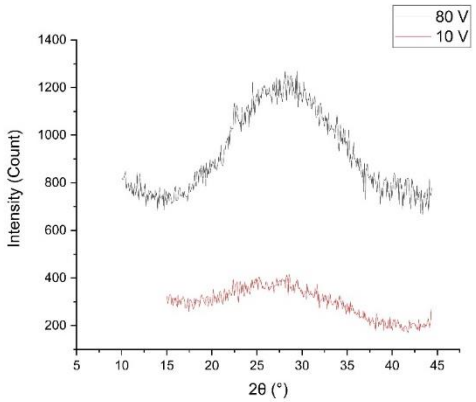

Figure 2. XRD pattern of PAAT synthesized at 10V (red line) compared to the signal from the plate synthesized at 80V (black line).

References:

[1] F. Keller, M. S. Hunter, and D. L. Robinson, "Structural Features of Oxide Coatings on Aluminum," J. Electrochem. Soc., vol. 100, no. 9, p. 411, 1953.

[2] J. P. O'Sullivan and G. C. Wood, "The Morphology and Mechanism of Formation of Porous Anodic Films on Aluminium," Proc. R. Soc. A Math. Phys. Eng. Sci., vol. 317, no. 1531, pp. 511–543, 1970.

https://doi.org/10.1017/S1431927622008698 Published online by Cambridge University Press