

The Influence of Thickness, Interpore Distance and Compositional Structure on the Optical Properties of Self-Ordered Anodic Aluminum Oxide Films

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Abstract

In the last years, the study of structural color obtained from the interaction of light with periodic nanostructures has generated immense interest, as a result of some colors found in nature are based on this interaction. This phenomenon can be applied in relevant scientific areas, such as: optic; photonic; magnetic; sensor; and biologic. High-ordered anodic aluminum oxide (AAO) templates are used to different applications and are one of the most studied periodic nanostructures. AAO films were fabricated by two step anodization process and the optical properties of these films were analyzed. The morphological parameters of the AAO films were adjusted in order to study the effect of these parameters on the UV-Vis reflectance properties of these films. These parameters are the thickness, pore diameter, interpore distance, porosity, pore arrangement regularity, and anodization electrolyte. The reflectance was found to depend on the thickness of the AAO films, on the interpore distance, and a strong dependence of the reflectance on the anodization electrolyte was found in the UV region, which was then explained using Raman spectroscopy. A statistical study was made to obtain a relation between the maximum reflectance and the morphological parameters of the AAO films (thickness and interpore distance) as are shown in Figure 1. This study would enable for the first time the unified prediction of porous alumina optical properties based on the morphology, and provides an important understanding of the UV-Vis reflectance properties of AAO films.

References

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Figure 1

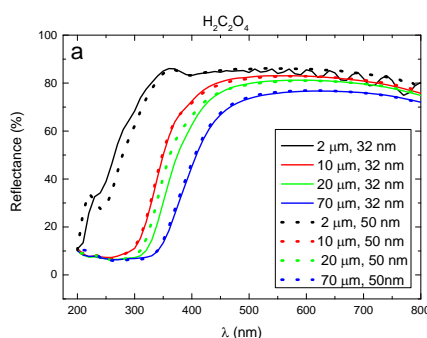


Figure 1. Reflectance as a function of the thickness and pore diameter of AAO.