

## Tailoring structural engineering of nanoporous anodic alumina photonic structures by pulse anodization

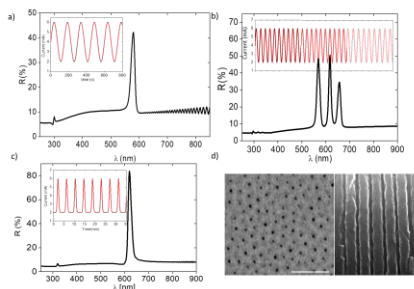
Laura K. Acosta, Josep Ferre-Borrull and Lluís F. Marsal

Departament d'Enginyeria Electrònica, Elèctrica i Automàtica, Universitat Rovira i Virgili, Avinguda Països Catalans 26, 43007 Tarragona, Spain  
[lluis.marsal@urv.cat](mailto:lluis.marsal@urv.cat)

Photonic Structures (PSs) are one-dimensional photonic crystals with a continuous and periodic variation of their refractive index with depth. They can be obtained based on nanoporous anodic alumina (NAA), formed by the electrochemical anodization of high-purity aluminum by means of an anodization current modulation. The pore modulation of the refractive index results in an interesting optical behavior consisting of a well-defined photonic stop band. Furthermore, several anodization profiles can be overlapped or stacked to produce films with several forbidden photonic bands [1-3]. The optical properties of NAA-RS can be engineered by adjusting several design parameters such as the average anodization current, the current amplitude, the period, and the number of periods of the current component [4-6].

In this work, we report recent results in the structural engineering of one-dimensional NAA photonic structures with different anodization profiles to obtain photonic bands located in the UV-Vis-NIR spectrum range. The effects of fabrication parameters are systematically assessed, revealing that the positions of the characteristic forbidden bands of PCs are highly controllable. Figure 1a shows the reflection spectrum of a photonic structure fabricated with a sinusoidal current profile (inset), and figure 1b shows a reflection spectrum of a photonic structure fabricated with a sinusoidal profile with stack configuration (inset). Figure 1c shows the reflection spectrum of a photonic structure fabricated with a gaussian current profile (inset) and 1d shows the FESEM top view and cross-section respectively of the gaussian photonic structure.

**Acknowledgments:** This work was supported by the Spanish Ministerio de Ciencia e Innovación (MICINN/FEDER) PDI2021-128342OB-I00, by the Agency for Management of University and Research Grants (AGAUR) ref. 2021-SGR-00739, by the Diputació de Tarragona (DIPTA) 2022/33, and by the Catalan Institution for Research and Advanced Studies (ICREA) under the ICREA Academia Award.



**Figure 1.** Reflection spectra of (a) Photonic structure with sinusoidal current profile, (b) Photonic structure with sinusoidal current profile in stack configuration, (c) Photonic structure with gaussian current profile and (d) FESEM top view and cross-section of gaussian photonic structure.

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