Stacked and Overlapped Photonic Structures in Nanoporous Anodic Alumina

Laura. K Acosta, Elisabet Xifre-Perez, Josep Ferré-Borrull, and Lluis F. Marsal

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

Nanoporous anodic alumina (NAA) is a promising material formed by the electrochemical anodization of aluminium, a cost effective and fully scalable process compatible with convetional micro and nanofabrication approaches that allows the precise control over the geometry and distribution of the pores [1-2]. The optical properties of NAA rely intrinsically upon its nanoporous architecture. Therefore, to engineer the nanoporous structure of NAA provides novel means of modulating its refractive index in a multidimensional fashion to fabricate advanced materials with unique optical properties to guide, reflect, transmit, emit incident light [3]. The design of photonic structures with innovative architectures and materials can control light–matter interactions at the nanoscale in novel ways. These nanostructures would enable new opportunities to develop advanced materials for many applications, including optical chemical sensing and biosensing [4]. In this work, we present a comprehensive study of diferent photonic structures based on single and multiple periodic structures with sinusoidal profiles in an overlapped and stacked configuration. Figure 1 shows the conceptual illustration of the fabrication and characterization of multiple photonic structures with sinusoidal profile in stacked configuration and their application of photonic structures for the detection of Glucose.

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References

[1] J. Ferre-Borrull, J. Pallares, Macías G, L.F. Marsal, Materials. 7 (2014). 5225-5253
[2] G. Macias, L.P. Hernández-Eguía, J. Ferré-Borrull, J. Pallares, L.F. Marsal, ACS Appl. Mater. Interfaces, 5 (2013) 8093.
[3] T Kumeria, A Santos, MM Rahman, J Ferré-Borrull, LF Marsal, D Losic, ACS Photonics 1 (2014), 1298-1306
[4] Laura K. Acosta, Francesc Bertó-Roselló, E. Xifre-Perez, Abel Santos, J. Ferre-Borrull, L.F. Marsal. ACS Appl. Mater. Interfaces, 11, (2019). 3360-3371

Figures

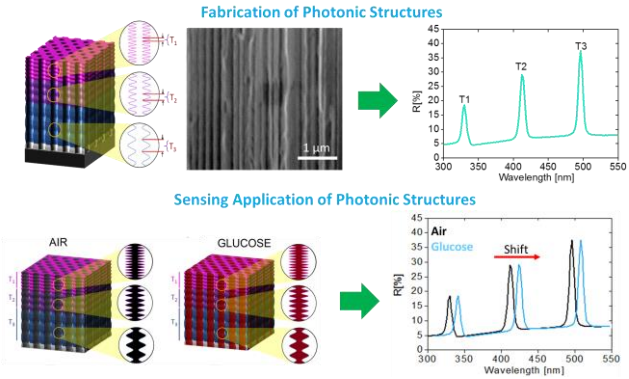

Figure 1: Conceptual illustration of fabrication and characterization of Photonic structures in stacked configuration and sensing application of Photonic Structures with Glucose.