Optical analysis on infiltration of Rhodamine dye inside Nanoporous anodic alumina Gradient-index filters

Pankaj Kapruwan

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

*Corresponding authors e-mail address: josep.ferre@urv.cat, lluis.marsal@urv.cat

In the past decade, Nanoporous Anodic Alumina (NAA) has proved itself to be one of the most diversified template to be used in several drug delivery and bio sensing applications [1-2]. This material offers ease of fabrication, mechanical robustness, stable optical signals and tuneable surface chemistries. Light propagation amongst photonic structures (distributed Braggs reflectors, gradient-index filters) can be easily tuned by the precise engineering of their structural components. In order to develop advanced drug delivery systems based on these photonic structures, it is crucial to develop reliable methods to analyze the loading and release mechanism of drug within the nanopores. Pertaining to this, NAA-GIFs serves as one of the promising structures as photonic stopbands can be tuned at desired spectral wavelengths.

In this work, we have demonstrated the use of optical properties of NAA-GIFs to assess the molecular loading profile of Rhodamine 6G dye (serve as a model drug). The structural tuneability of photonic stopbands in NAA-GIFs allows one to obtain one of the bands in the same range as the absorption of the model drug while the second stopband is placed far away from the absorption region. This permits one to obtain a ratio between the reflectance's of both the stopbands while the filling the nanoporous structures with the dye molecules. In addition, drop/dry method has been shown to be a simple and effective strategy to fill the pores.

REFERENCES:

1) Pol L, Eckstein C, Acosta LK, Xifré-Pérez E, Ferré-Borrull J, Marsal LF. Nanomaterials. 2019;9(3).

2) Porta-i-Batalla M, Xifré-Pérez E, Eckstein C, Ferré-Borrull J, Marsal LF. Nanomaterials. 2017;7(8):

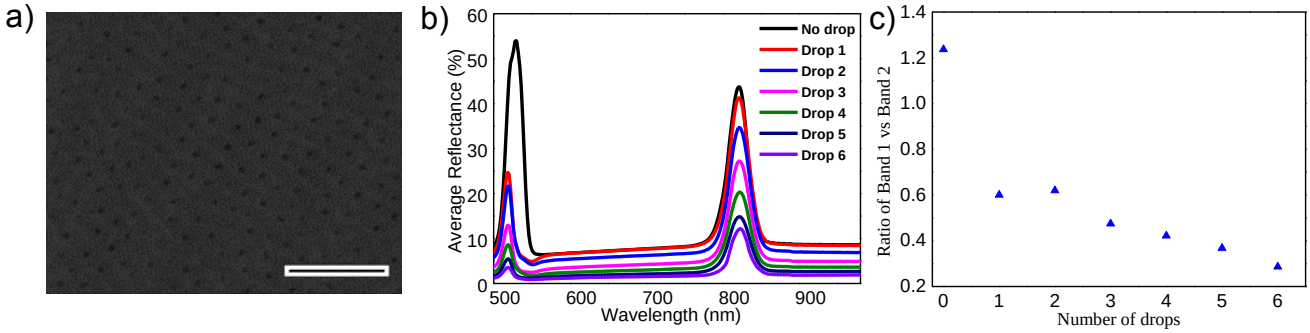

Figure 1. a) ESEM Top view of NAA-GIFs respectively. Scale bar 1µm; b) Reflection spectrum of NAA-GIFs with two photonic peaks after each drop/dry cycle; c) Ratio analysis between stopband 1 & 2.