

Analyzing the loading and release of Rhodamine 6G dye from Nanoporous anodic alumina rugates filters using optical methods

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Abstract

Porous materials constitute one of the best templates to be used in several drug delivery applications [1-2]. Amongst them, crucial developments have been reported in the field of widely known Nanoporous anodic alumina (NAA). Finely tuned engineering, along with ease of fabrication, stable optical signals, mechanically robustness and several reported chemistries on NAA have now made it easier to fabricate such structures [3-4]. On the other hand, reliable and effective drug release strategies need to be developed based on NAA for which it is an urgent requirement to understand in-depth loading and release mechanisms of several drug/dye molecules from the nanopores.

In this work, we have fabricated NAA-Gradient Index Filters (NAA-GIFs) platforms to gather information about the filling and release dynamics of Rhodamine 6G dye used as a model for a drug (Fig 1 a & b). Multiple photonic stopbands were designed in the structures being one in the absorption range of the dye while other one far from the absorption region. Simulations show (Fig. 2) that different amounts of dye inside the pores can be estimated by measuring the relative height of the maximum reflectance corresponding to the two stop bands. Reflectance measurements were also taken before and after dropping dye on the surface. Release profiles were measured by registering the change in reflectance spectra as the fluid wets the sample in a custom-made flow cell. All these results are put together to gain more information about the molecular behaviour inside the structure.

References

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Figures

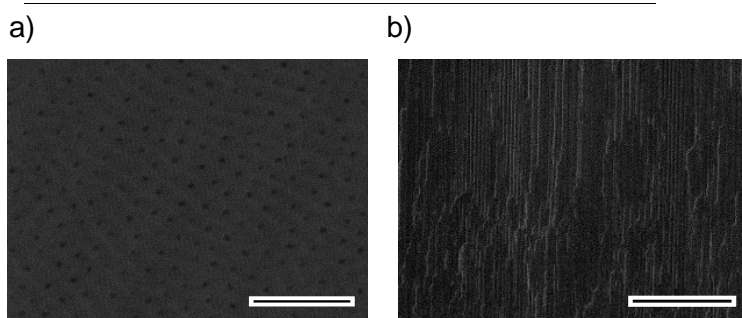


Figure 1: a & b) ESEM top and cross section of the NAA-GIFs respectively. Scale bar 1μm

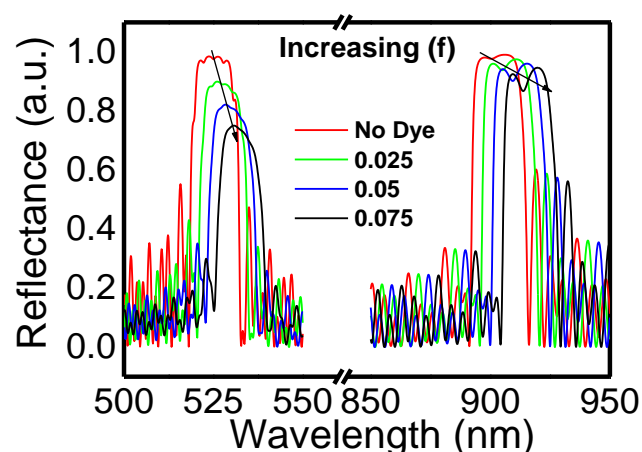


Figure 2: Simulation analysis of NAA/GIFs before and after dye filling inside nanoporous channels.