Keynote

Nanostructural engineering of nanoporous anodic alumina for optical biosensing

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The fabrication of self-ordered nanoporous anodic alumina (NAA) is based on simple, cost-effective, electrochemically anodization of aluminum, which yields vertically aligned, highly-ordered (hexagonal pattern) nanoporous structures [1]. Nanoporous anodic alumina is one of the most promising nanomaterials for developing new applications in biotechnology and nanomedicine for example: molecular separation, drug delivery systems, tissue engineering, etc. NAA presents some advantages in comparison with the well know porous silicon such as greater pH and thermal stability and fabrication flexibility to control pore structures.

Its optical and photonic properties such as reflectance, transmittance, absorbance and photoluminescence can be tailored by modifying the pore size and nanostructure [2,3,4]. Furthermore, its high surface area (up to several hundreds of square meters per gram) and easy chemical functionalization allows to design and fabricate nanoporous anodic alumina structures with special features for label-free optical biosensing [5,6].

In a first part, this talk will give an overview of nanoporous anodic alumina properties and several electrochemical approaches for fabricating optical structures such as tunable Fabry - Pérot interferometer, gold-coated double-layer nanoporous, distributed Bragg reflector, nanoporous rugate filter, etc. In a second part, the talk will presents and discuses some examples of label-free optical biosensing for the detection of proteins, enzymes and heavy metals.

References

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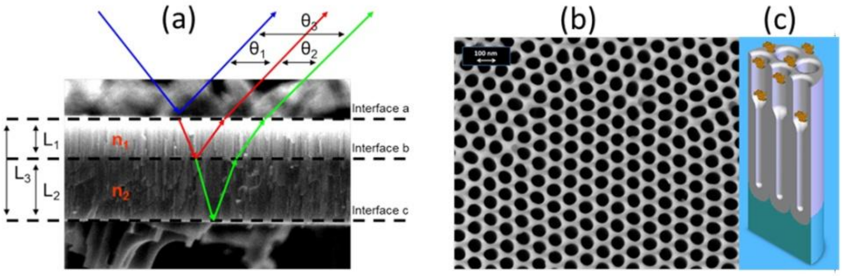

Figure 1. SEM images of the cross-sectional view (a) and top view (b) of a nanoprous anodic alumina bilayer (top layer with large pores and a bottom layer with smaller pores). The interfaces a, b, and c represent the zone where the reflections occur resulting in three interfering light beams. (c) Schematic representation of the nanoporous anodic alumina bilayer with trapped proteins in the first layer (top of the structure).