# Nanoporous anodic alumina based photonic structures for sensing applications

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**Abstract**
Nanoporous anodic alumina (NAA) has generated considerable attention in nanoscience and nanotechnology due to its cost-effective fabrication process, self-assembled, densely packed and nanoscale-ranged porous structure. The nanopores are straight through the film thickness, parallel to each other and with diameters in the range of 10 to 300 nm. The structural characteristics of the NAA such as pore diameter, interpore distance, porosity, film thickness and barrier layer thickness can be tuned by modifying the anodization conditions [1, 2]. In addition, NAA has demonstrated to be excellent material for producing optical devices by their outstanding set of properties. Optical and photonic properties as reflectance, transmittance, absorbance and photoluminescence can be structurally engineered by modifying the effective medium of the NAA [3, 4]. Furthermore, further chemical functionalization endows NAA platforms with chemical selectivity for detection of specific analytes.
In this work, we introduce new different techniques developed in our group for the structural engineering of nanoporous anodic alumina. We show different examples of engineered NAA for sensing: the definition of photonic barcodes from photoluminescence or reflectance spectra of NAA, the improvement of sensitivity in two-layer NAA structures and the refractive index sensing device using the central wavelength of a rugate filter stop band, etc [5-8]. Finally, we analyze and discuss different detection techniques such as reflectometric interference spectroscopy, photoluminescent spectroscopy and test their performance in the detection of proteins and heavy metal ions.

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