Engineering gold nanoclusters-decorated on nanoporous anodic alumina for biosensing applications

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Self-ordering nanoporous anodic alumina (NAA) is a material obtained through a two-step anodization process of aluminium. This process is carried out by an electrochemical reaction based on an acid solution. Different interpore distances and pore sizes can be obtained depending on the anodization conditions [1]. The possibility to control the different parameters of the anodization (temperature, potential and charge), allow us to fabricate NAA with different morphologies such as bilayers, rugates, nanotubes, etc., that can be used to detect different analytes [2], [4-6]. Figure 1 shows the top-view and cross-section field emission scanning electron microscopy (FESEM) images of an NAA structure fabricated using oxalic acid. The pore diameter is 30 nm and the interpore distance is 80 nm.

In this study, we developed a photonic biosensor that uses a monolayer of NAA with gold nanoclusters to detect Endoglin 105. Nanoporous anodic alumina (NAA) and gold nanoclusters (AuNCs) were used to combine their optical and geometrical properties.

The effect on the photoluminescence of NAA attached gold nanoclusters on its structure following their functionalization with a specific antibody, for the detection of Endoglin 105 was investigated [9]. Figure 2 shows the changes in the PL for different concentrations of Endoglin 105. The results obtained indicate that this can be a promising platform for the detection of different biomolecules.

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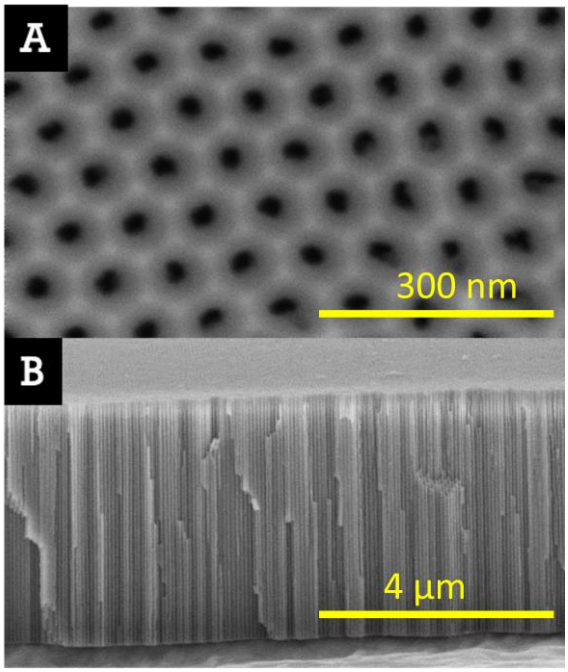

Figure 1. FESEM images of a NAA sample after a two-step anodization process. A) top-view and B) cross-section.

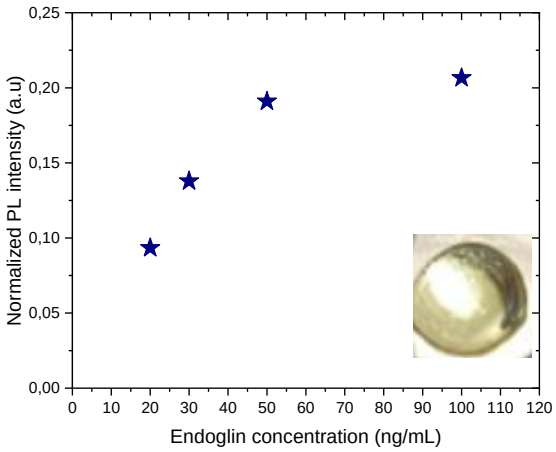

Figure 2. Photoluminescence response of the sensor for different protein concentrations. Inset shows the image of AuNC - nanoporous anodic alumina used in the experiments.

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