Photoluminisce sensor based on nanoporous anodic alumina for Endoglin 105 detection

Josep Maria Cantons Pérez, Akash Bachhuka, and Lluis F. Marsal*
Departament d'Enginyeria Electrònica, Elèctrica i Automàtica, Universitat Rovira i Virgili, Avinguda Països Catalans 26, 43007 Tarragona, Spain, email: lluis.marsal@urv.cat; akash.bachhuka@urv.cat

Nanoporous anodic alumina (NAA) is a porous material obtained through the oxidation of aluminium. This oxidation is done by an electrochemical process based on an acid solution. Depending on the used acid, different pore sizes are obtained from 18 to 120 nm approximately [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 that can be used to detect more than one [2]. This also let us adjust the optical properties of NAA, making it interesting for many sensing, drug delivery and tissue engineering applications [3]. One of its interesting properties is the photoluminescence (PL) [4], which is an optical property in which the material gets excited to a higher energy state due to the absorption of light and emits a photon on the return of its electron back to a lower energy state. In this work, we study the effect on the photoluminescence of NAA infiltrating gold nanoclusters on its structure following by the, the gold nanoclusters functionalizartion with a specific antibody, for the detection of different concentrations of Endoglin 105. Figure 1a shows the FESEM cross section of NAA structure. Figure 1b shows the changes on the PL while adding different concentrations of Endoglin 105.The results showed the photoluminescence response at at 425 nm, corresponding to the NAA, and it also showed a peak at 600 nm, corresponding to the gold nanoclusters when binnded to the NAA surface.

Acknowledgments: This work was supported by the Spanish Ministerio de Ciencia e Innovación (MICINN/FEDER) PDI2021-128342OB-I00, by the Agency for Management of University and Research Grants (AGAUR) ref. 2021-SGR-00739, by the Diputació de Tarragona (DIPTA) 2022/33, Juan de la Cierva incorporation fellowship (IJC-2019-042374-1), Beatriu de Pinos Grant (2021 BP 00105) and by the Catalan Institution for Research and Advanced Studies (ICREA) under the ICREA Academia Award

References

[1] A. I. Sadykov, A. P. Leontev, S. E. Kushnir, A. V. Lukashin, and K. S. Napolskii, Russ. J. Inorg. Chem, vol. 674, no. 3, pp. 668–674, 2011.
[2] Santos A, Vojkuvka L, Alba M, Balderrama V, Ferré-Borrull J, Pallarès J, Marsal L.F., Physica Status Solidi (A) Applications and Materials Science, 209(10):2045-2048, 2012.
[3] J. Ferré-Borrull, E. Xifré-Pérez, J. Pallarès, and L. F. Marsal, (2015), Losic, D., Santos, A. (eds) Nanoporous Alumina. Springer Series in Materials Science, vol 219. Springer, Cham.
[4] I. V. Gasenkova, N. I. Mukhurov, S. P. Zhvavyi, E. E. Kolesnik, and P. Stupak, J. Lumin, vol. 185, pp. 298–305, 2017.

Figures

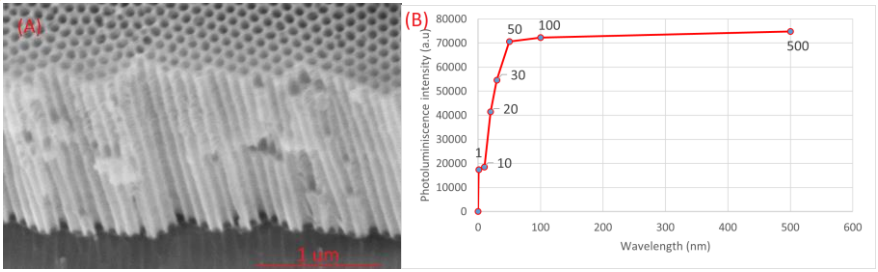

Figure 1. (a) FESEM images of NAA cross-section structure. (b). PL response of different concetrations of Endoglin 105 incubated in NAA-functionalized with gold nanoclusters.