Photoluminescent porous alumina particles for the development of label-free biomarkers

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Abstract

Particles in the micrometric and nanometric range have attracted great interest in recent years especially because of their interesting properties for biotechnological applications [1,2]. Porous anodic alumina can be an excellent material for the formation of these particles. Porous alumina is obtained by the electrochemical etching of highly-pure aluminum and consists of nanometric pores hexagonally arranged in an alumina matrix. Its geometric characteristics, such as pore size, interpore distance, porosity, and thickness, can be controlled by the anodization conditions (voltage and time of anodization, temperature, and acid used as electrolyte, etc.) [3]. Therefore, we are able to tune the porous morphology of porous alumina to meet the requirements of its very diverse applications. The physical, chemical and optical properties of this material together with its nontoxicity, its highly stable morphology in buffer solutions and its cost-effective fabrication [4] makes of porous alumina an interesting material for the development of particles for biological applications. Especially remarkable is its high effective surface area, that can be chemically modified with organic compounds [5]. Furthermore, another singular characteristic distinguishes porous alumina from many other materials: its inherent photoluminescence in the visible spectrum range (Figure 1). In this work, we present porous alumina particles and evaluate their properties for the development of label-free biomarkers and also for a wide range of applications in the biomedical and biotechnological fields.

Acknowledgements

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Figures

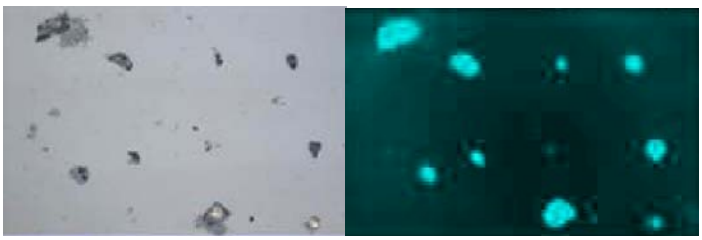

Figure 1. Photoluminescent porous alumina particles: white light (left), DAPI filter (right).