**All-nanoparticles based Optical Resonators for detection of gases and liquids**

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In last years, nanoparticles based one dimension photonic crystals (NP-1DPC) have developed high optical and structural qualities. They have already become a very important component of fotonic devices like dye solar cells. They also present an important potential as optical resonators, due to their capacity to house many different types of light emitters, with many different irregular shapes, like rare earths based nanophosphors. Herein we show that the photoemission spectrum of nanophosphors can be precisely controlled by integrating them in a rationally design photonic environment. In this work, we present a versatile method to embed these kind of nanophosphors of arbitrary shape in optical resonators built up within NP-1DPC **[1]**. By precise control of the spectral features of such cavity modes, luminescence is amplified or suppressed in selected and tuneable wavelength ranges. We also demonstrate that the porous character of the building blocks of these photonic crystals provides a responsive multifunctional matrix, totally different emission spectra being attained from the same nanophosphors by environmentally induced changes of the cavity modes. This fact makes these structures perfect for the detection of liquids and gases.

**References**

[1] O.Sánchez-Sobrado, M.E.Calvo, N.Núñez, M.Ocaña, G.Lozano, H.Míguez, *Nanoscale*, 10.103a/b9nr00338

**Figures**

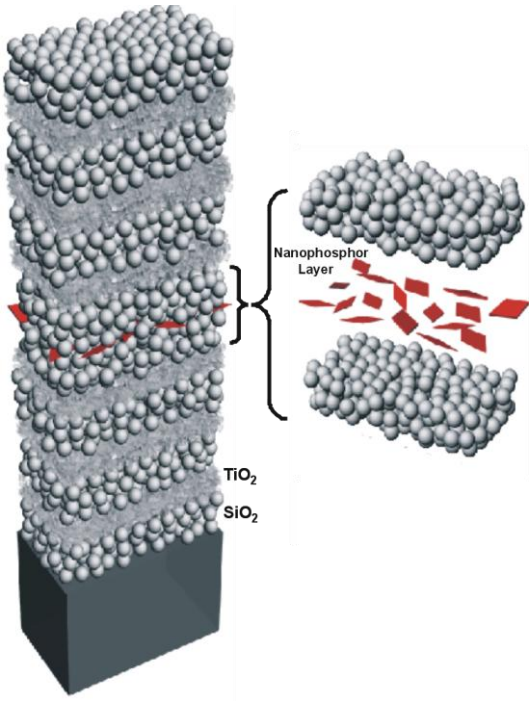


**Figure 1.** Model of the proposed all-nanoparticle based optical resonator. Spherical beads represent $SiO_2$ nanocolloids, smaller ones of irregular shape are TiO2 nanocrystals and (red) rhombic particles are the embedded nanophosphors. On the left, the different components of the optical cavity are amplified and separated for the sake of clarity.

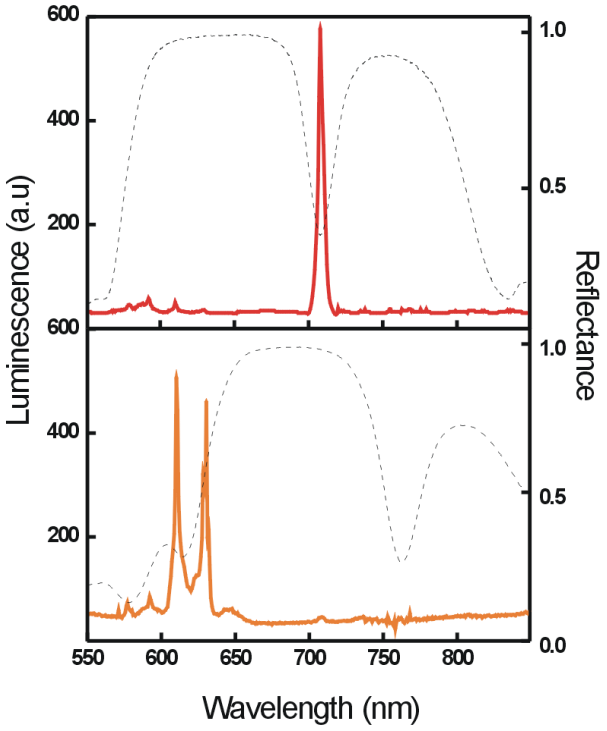


**Figure 2**. Luminescence (thick lines) and reflectance (thin lines) spectra obtained from a nanophosphor containing optical resonator built using two Bragg mirrors made of 5 unit cells (a) before and (b) after being infiltrated with ethanol.