

Rewritable light sources in a photonic crystal cavity

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Control of spontaneously emitted light is essential for diverse applications ranging from light emitting devices to single photon sources for quantum information. Photonic Crystal^[1] cavities have shown to be good candidates to engineer the spontaneous emission rate of an emitter^[2]. A broad range of cavity designs have been proposed,^[3-4] their production requires the incorporation of defects, which constitute the cavity, at the Photonic Crystal growth stage, limiting the realization of the defect to simple absence of pores, to pores of different sizes and/or pores at different positions. New prospects open when defects are introduced after the device's realization by local infiltration^[5] of active/passive materials. In fact, this more flexible technology permits the realization of tunable and rewritable devices .

In this work we present the experimental observation, by means of near-field microscopy, of the modified emission spectrum of a light-emitting source by using colloidal quantum dots locally infiltrated in the central pore of a two dimensional photonic crystal cavity (Fig. 1). Our new technique allows to introduce the active medium inside the cavity and modify the cavity mode frequencies due to the presence of a material with a certain refractive index inside the central pore. In this way, changing the active medium it is possible to tune the resonance of the cavity on demand.

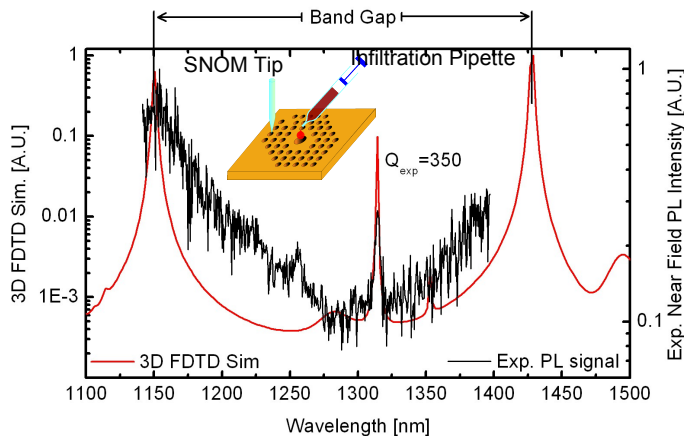


Fig. 1: The figure shows the near field emission spectrum of the infiltrated quantum dot (black line) inside the central pore of a two dimensional photonic crystal cavity suspended on a membrane. The experimental data are compared with a 3D FDTD simulation (red line).

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