Fine control transition from photonic crystals to photonic glasses

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Abstract:

The control of light transport is crucial, not only to understand the behavior of light propagating in complex media, but also to design and tailor new photonic devices [1]. In this way, self-assembly allows us to design photonic nanostructures with novel optical properties such as forbidden energy bands in photonic crystals or resonant light transport in photonic glasses [2]. However, the transition from photonic crystals to photonic glasses is not fully understood so far. One way to explore this transition is by introducing random vacancies in photonic crystals, in a controlled manner, without altering the lattice parameter [3]. This is mandatory to really discern between Bloch and Mie modes and understand the nature of laser emission in such different photonic environments [4]. Here we show how by achieving very high control on the number of vacancies (fig. 1) we can fine-tune this transition. Different behavior for light transport has been observed inside and outside the photonic band gap, depending on the number of vacancies [5].

References:

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Figures

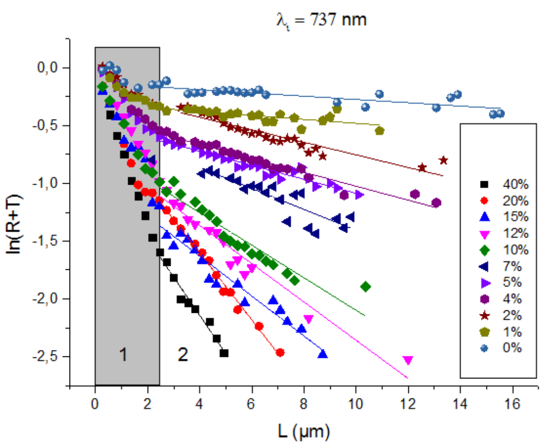

Figure 1.Lambert-Beer´s law in photonic crystal. Plot ln(R+T) as a function of the sample thickness inside band gap (λ_i = 737 nm), for different %ρ (from 0% to 40% vacancies doping).