Bending the flow of light with graded photonic crystals

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We present the concept of graded photonic crystals and show its ability to bend the light path at the scale of the wavelength [1-2]. Graded photonic crystals (GPCs) are obtained by appropriate gradual modifications of photonic crystals parameters (such as the filling factor). The light bending which depends on the wavelength and on the incident angle is explained thanks to the concept of local photonic band structure. We demonstrate that photonic mirages can appear at the micron scale and that they originate from the same physical principles as the usual atmospheric mirages. Two optical components based on two-dimensional GPCs presenting a superbending effect (fig. 1) and a large beam shifting (fig. 2) are presented.

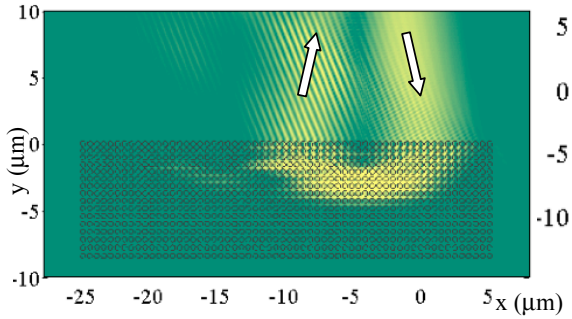

Figure 1 : Superbending effect: the beam is bent at 180° over 10 µm distance. The white arrows indicate the direction of light.

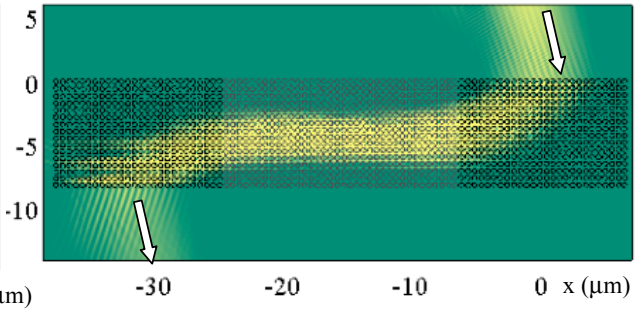

Figure 2: Large beam shifting in a 2D-gradient lattice. Light is curved inside the input and output GPCs and it is propagated in straight line inside the tapered GPC.

[1] E. Centeno, D. Cassagne and J-P. Albert, *Mirage and superbending effect in two-dimensional*, Phys. Rev. B **73,** 235119 (2006).

[2] E. Centeno, D. Cassagne, *Graded photonic crystals*, Opt. Lett. Opt. Lett. **30**, 2278 (2005).