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"Phoxonic crystals and optomechanical properties: interaction of photons and phonons"

Abstract

We study the optomechanical interactions in phoxonic crystals which are defined as dual phononic/photonic crystals that can exhibit simultaneously phononic and photonic band gaps. The existence of absolute band gaps allows the simultaneous confinement of both waves that, in turn, can produce the enhancement of their interaction for the purpose of novel and high-performance optomechanical and acousto-optic devices and applications.

A main objective is the modulation of light by acoustic waves when both excitations are confined inside the same cavity or propagate with a slow group velocity inside a waveguide. We have studied theoretically the optomechanical interactions in different (2D bulk, slab, and strip) phoxonic crystals cavities.

We have demonstrated the dependence of these optomechanical interactions as a function of both the nature of the material and the incoming optical wavelength. The results for strip waveguides have been compared with experimental results performed by our partners. Finally, as a perspective, we began to study the phonon-plasmon coupling.