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Photon-phonon coupling in acousto-optical microcavities MARTIN MALDOVAN, EDWIN THOMAS, Massachusetts Institute of Technology — Periodic materials have unique physical properties due to their singular interaction with waves. Photonic crystals can control the propagation of light and can be engineered to guide optical beams or confine and trap light resonantly. Analogously, phononic crystals can manage the propagation of mechanical waves and can be used for acoustic filtering or localization of sound. In this paper, we present a new class of physical system that combines photonic and phononic properties. We show how photons and phonons can be localized in the same area at the same time, providing new means for an enhanced interaction between them. We calculate the strength of optical and mechanical interactions considering different structural morphologies and materials for the proposed photonic-phononic crystals. This research helps to develop physical mechanisms for light-induced generation of coherent mechanical excitations in photonic crystals, photon-phonon mediated effects that can result in optical cooling, and the simultaneous management of optical and mechanical waves on a photonic-phononic microchip.

Martin Maldovan
MIT

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