Nano-opto-mechanical Nonlinearity in Metamaterials

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Strong opto-mechanical nonlinearity can be achieved through the coupling of optical and mechanical resonances in dynamically reconfigurable nanostructured materials. Such media offer a highly adaptable platform for the engineering of profound electro-, magneto- and acousto-optic switching coefficients. Here, we present all-dielectric and plasmonic metamaterial systems manifesting, respectively, optomechanically asymmetric transmission underpinned by the action of ponderomotive optical forces, and acoustically-/optically-controlled bistability. Both provide for near-infrared transmission/reflection modulation at low ($\mu W/\mu m^2$) intensities in a structure $<^1/_3$ of a wavelength thick.