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Optomechanical Coupling in Dimerized Subwavelength Metastructures

Masters research

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Abstract

Optomechanical coupling occurs wherever optical light fields couple to mechanical motion through radiation pressure and transfer a momentum [1]. This impulse causes the oscillator to deflect, which in turn influences the structure of the system. As the frequency of the light depends on the structural conditions of the system, it shifts [2] [3].
Dimerized metastructures are one example for optomechanical coupling and are especially relevant for investigation as they can be used for all-optical light control. Dimerized subwavelength metastructures are engineered materials with subwavelength scattering elements [4]. The dimerization arranges the scattering elements with a double grating period, which results in the formation of unit cells. Each unit cell contains two scattering elements, referred to as dimers [5]. This geometry is advantageous as it results in an asymmetrical light field distribution, which leads to asymmetrical optical forces that elevate mechanical motion.
Within this research the optical, mechanical and optomechanical potential of a dimerized metastructure is investigated. Furthermore, its optomechanical coupling constant, which indicates the shift of the optical frequency due to the displacement of the dimers, is briefly discussed.

References

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