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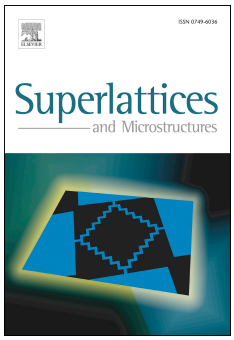

Tunable optical response at the plasmon-polariton frequency in dielectric-graphene-metamaterial systems

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Tunable optical response at the plasmon-polariton frequency in dielectric-graphene-metamaterial systems.

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Abstract

By using the scattering matrix formalism, it is studied the optical properties of one dimensional photonic crystals made of multiple layers of dielectric and uniaxial anisotropic single negative electric metamaterial with Drude type responses, with inclusions of graphene in between the dielectric-dielectric interfaces (DGMPC). The transmission spectra for transverse electric (TE) and magnetic (TM) polarization are presented as a function of the incidence angle, the graphene chemical potential, and the metamaterial plasma frequencies. It is found for the TM polarization the tunability of the DGMPC optical response with the graphene chemical potential, which can be observed by means of transmission or reflexion bands around the metamaterial plasmon-polariton frequency, with bandwidths depending on both the incidence angle and the metamaterial plasma frequency. Also, the transmission band is observed when losses in the metamaterial slabs are considered for finite systems. The conditions for the appearance of these bands are shown analitically. We consider this work contributes to open new possibilities to the design of photonic devices with DGMPCs.

Keywords:
Graphene, Photonic crystal, Metamaterial, Anisotropy

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