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标题: Bandgap generation and enhancement in polaritonic cylinder square-lattice photonic crystals
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摘要: A theoretical study based on the finite-difference time-domain method is presented to investigate the maximum possible extent of the lowest complete structural bandgap in a two-dimensional polaritonic photonic crystal and the corresponding slab structure consisting of polaritonic cylinders placed on a square lattice in an air matrix. Three different polaritonic materials, which are classified according to their polaritonic strength and high-frequency dielectric constant, are chosen to calculate the corresponding photonic band structures. Our results reveal a considerable amount of complete structural bandgap generation and enhancement in terahertz parts of the spectrum by optimizing both the lattice constant and the filling fraction. Gap generation and enhancement occur over spectral regions which are completely below the polariton resonance of the materials for both polarizations. One noticeable result shows that in contrast to the corresponding structures made of non-dispersive dielectric cylinders, a large complete structural gap is generated in the polaritonic photonic crystal made of ionic cylinders having a small high-frequency dielectric constant but robust photon-phonon interaction through the proper choice of design parameters.
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