Abstracts

Finite Difference Analysis of 2-D Photonic Crystals

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In this paper, a finite difference method is developed to analyze the guided-wave properties of a class of two-dimensional photonic crystals (irregular dielectric rods). An efficient numerical scheme is developed to deal with the deterministic equations resulting from a set of finite difference equations for inhomogeneous periodic structures. Photonic band structures within an irreducible Brillouin zone are investigated for both in-plane and out-of-plane propagation. For out-of-plane propagation, the guided waves are hybrid modes; while for in-plane propagation, the guided waves are either TE or TM modes, and there exist photonic bandgaps within which wave propagation is prohibited. Photonic bandgap maps for squares, veins, and crosses are investigated to determine the effects of the filling factor, the dielectric contrast, and lattice constants, on the band-gap width and location. Possible applications of photonic bandgap materials are discussed.

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