

A new topology optimization algorithm for photonic band gap structures

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Abstract

A new topology optimization algorithm is proposed based on bi-directional evolutionary structural optimization (BESO) method in order to design photonic crystals with maximum band gaps. The optimization process starts from a simple unit cell without band gap, and the photonic crystals are assumed to be periodically composed of two materials with different permittivity. Based on finite element analysis, the BESO algorithm gradually re-distributes dielectric materials within the unit cell until the resulting photonic crystals possess a maximal band gap at appointed position in the band diagram. Numerical results are presented to demonstrate the effectiveness of the proposed optimization algorithm.

Keywords: Topology optimization; photonic band gap; bi-directional evolutionary structural optimization (BESO).