

## 论文

### 一维新型阶梯函数光子晶体透射特性

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#### 摘要:

研究了阶梯型折射率 $n_{22}$ 、 $n_{11}$ (阶梯分布高度)的大小、对应的分布厚度、不同入射角以及缺陷模对阶梯函数型光子晶体透射特性的影响.由费马原理给出光在函数光子晶体中的运动方程,再由电磁传播理论给出函数光子晶体的传输矩阵,进一步推导出函数光子晶体的透射率以及电场分布的表达式.研究表明,1)随 $n_{22}$ 、 $n_{11}$ 大小或者厚度改变,其禁带变宽;2)随光的入射角增加,其禁带变窄;3)当加入缺陷层时,随着缺陷层介质折射率增加,缺陷模强度减小且位置发生红移;4)在函数光子晶体中,缺陷层前电场分布保持不变,而在缺陷层处以及之后的电场强度都明显增强,这不同于常规光子晶体的电场分布仅在缺陷层处局域增强.

关键词: 函数光子晶体 透射率 缺陷模 光传输特性

## Transmissison Characteristic of Ladder Type Function Photon Crystals

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#### Abstract:

Effects of refractive indexes  $n_{22}$ 、 $n_{11}$  (distribution height of ladder), their corresponding thicknesses, and different incident angles and defect layers on the transmission characteristic of function photonic crystals (PCs) with ladder type are studied. Based on Fermat principle, the motion equations of light are given, and by the theory of electromagnetic wave transmission, its transfer matrix is calculated. Further, the expression of transmissivity and the electric field are deduced. The results show that: 1) with the changes of the refractive indexes  $n_{22}$ 、 $n_{11}$  or their thicknesses, the width of band gaps become wider; 2) when the incident angles increase, the width of band gaps become narrow; 3) when adds defect layer, as refractive index of defect layer increasing, the intensity of defect mode decreases and its position becomes red shift; 4) light electric field distribution in the function PCs is studied and some new results different from the convention photonic crystals are obtained.

Keywords: Function photon crystals Transmissivity Defect model Transmission peculiarity

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