

## 量子光学

### 光波在三维光子晶体中定域化特性的数值研究

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摘要:

基于Mie散射理论和低浓度近似, 对锗蛋白石类光子晶体中的光子定域化现象进行了研究, 数值揭示了入射波长、散射体大小和基质折射率对定域化参量的影响规律。结果表明, 在散射体浓度为10%, 相对折射率大于3.8, 在中红外区3 $\mu\text{m}$ ~12 $\mu\text{m}$ 范围内出现了理想的定域化现象; 随着入射波长的增大, 定域化区所对应的散射体半径增大, 定域化参量减小; 同时, 基质折射率的增大导致退定域化现象。

关键词: 量子光学 光子晶体 光子定域化 Mie散射 Ge材料

### Localization properties of optical waves through three dimensional photonic crystals

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Abstract:

Based on the Mie scattering theory and the low density approximation, the photonic localization of opal photonic crystal constituted by Ge was studied. The influence laws between the incidence wavelength, the size of the scatterer, the refractive index of medium and localization parameters were numerically revealed. The results show that the ideal photonic localization phenomenon appears in middle infrared band (3 $\mu\text{m}$ ~12 $\mu\text{m}$ ) under the conditions of the scatterer's density of 10% and the relative refractive index greater than 3.8; with the increase of incidence wavelength, the localization area shifts to greater scatterer's radius, and the localization parameter decreases. Meanwhile, with the increase of medium's refractive index, the localization phenomena become weak.

Keywords: quantum optics photonic crystal photonic localization Mie scattering Ge material

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