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激光技术与器件

二维各向异性随机介质内光波模式的特性研究

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摘要：

通过建立能够描述各向异性介电常数变化情况的二维随机介质模型，利用时域有限差分法联立求解随机介质中光波所满足的Maxwell方程和激光速率方程，研究了各向异性散射增益材料中的随机激光辐射现象。结果表明随机介质中各向异性散射颗粒的无序程度由空间位置无序和空间方向无序共同决定，空间方向的无序能够加强随机激射的辐射。同时存在两种无序机制的随机介质，在相同条件下它的随机辐射行为要强于仅存在一种无序机制的随机介质。研究结果对于研制新型各向异性随机介质材料具有指导作用。

关键词： 激光物理 随机介质 光波局域化 非线性光学

Optical characteristics of light waves in two-dimensional random media with uniaxial scatterers

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A new model was built for the research on two-dimensional anisotropic random medium, and the dielectric constant distribution was precisely described. The optical property of the light waves in two-dimensional random media with uniaxial scattering particles investigated by simultaneously solving Maxwell’s equations and rate equations of electronic population. Results show that ordered scatterers in anisotropic material can also form localization of light-waves if the index of refraction of the uniaxial scatterers distribute randomly in two-dimensional media. The randomness of the rotation angle of the optic axis determines the index of refraction of each scattering particle and reinforces the random lasing in random media. The results are very helpful for the development of new anisotropic random material.

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Keywords: laser physics random media localization of light wave nonlinear optics

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