

理论研究

LN晶体自散焦到自聚焦转换的耦合理论分析

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摘要

对铌酸锂晶体进行了三阶非线性折射系数测量的Z扫描实验和光折变非线性系数测量的时间扫描实验。为了分析时间分辨扫描曲线的特点,基于非线性介质中光折变非线性与三阶非线性光学效应的耦合作用,引入非线性折射率随时间变化的表达式,分析了空间亮孤子的形成过程,进而揭示了其在一定条件下从自散焦到自聚焦转换的动态行为的物理机制,得到了与实验现象相一致的结论,并说明了自聚焦光折变晶体中可能存在稳定的暗空间孤子。

关键词 [光折变效应](#) [三阶非线性](#) [自散焦](#) [自聚焦](#) [孤子](#)

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Analysis of transform from self-defocusing to self focusing of LN crystal based on coupling theory

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Abstract Z-scan experiment for measuring three-order nonlinear refractive coefficient and time-resolved scan experiment for measuring photorefractive nonlinear refractive coefficient were made with lithium niobate crystal doped with Fe and Tb. To explain the characteristics of the time-resolved scan curves, based on the coupling effects of photorefractive and third-order nonlinearity in the nonlinear medium, together with two analogic refractivity-timed expressions, an analysis on the dynamic evolving process of spatial bright soliton is made and eventually the physical mechanism of dynamical evolution from self-defocusing effect to self-focusing one under specific experimental condition is presented, which is completely coincident with the experimental phenomenon. The analysis has also validated the existing possibility of spatial dark soliton in self-focusing photorefractive crystal.

Key words [photorefractive effect](#) [third-order nonlinearity](#) [self-defocusing](#) [self focusing](#) [soliton](#)

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