论文

核壳结构CdSe/ZnS量子点量子阱中$1s_e1s_h$激子光跃迁的受激光子回波研究

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摘要：

在建模和理论分析的基础上, 对三脉冲飞秒激光作用下核壳结构CdSe/ZnS量子点量子阱中$1s_e1s_h$激子光跃迁引起的受激光子回波效应进行了深入研究.运用有效质量近似方法求解了载流子的静态薛定谔方程,得到能量本征值和对应波函数.基于光学Bloch方程,分析了受激光子回波的参量相关性.结果显示受激光子回波信号可以通过量子点量子阱结构和尺寸的改变进行有效调节.同时,在量子尺寸限制理论的基础上讨论了结构和尺寸的变化对受激光子回波信号的具体影响.

关键词： 受激光子回波　核壳结构量子点量子阱　光学Bloch方程

Investigation on Stimulated Photon Echo Induced by Optical Transition of $1s_e1s_h$ Excitons in Core-shell CdSe/ZnS Quantum Dot-quantum Well

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Abstract:

Excited with three femtosecond laser pulses, the stimulated photon echo phenomenon is studied, which is induced by the optical transition of $1s_e1s_h$ excitons in a core-shell CdSe/ZnS quantum dot-quantum well. The energy eigenvalues and eigenfunctions of charge carriers were obtained by solving the stationary Schrödinger equation under the effective-mass approximation. The parameter dependence of the photon echo signals was investigated employing the optical Bloch equations. The numerical results reveal that the stimulated photon echo phenomenon can be effectively controlled by the variation of the size and structure of quantum dot-quantum well. And the corresponding mechanism was discussed in terms of the quantum size confined effect theory.

Keywords: Stimulated photon echo　Core-shell quantum dot-quantum well　Optical Bloch equations

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