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页] [关闭]

论文

蒽二酮类化合物的合成及结构-非线性光学性能关系的研究

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摘要:

设计合成了6个新的蒽二酮类化合物,用紫外可见吸收光谱、傅里叶变换红外光谱、¹H核磁共振和元素分析表征了结构.采用飞秒激光,运用简并四波混频法,研究了化合物在非共振状态下的三阶非线性光学性能.它们的三阶非线性光学极化率 $\chi(3)$ 为 $2.62\sim 3.55\times 10^{-13}$ esu,非线性折射率 n_2 为 $4.82\sim 6.52\times 10^{-12}$ esu,分子二阶超极化率 γ 为 $2.57\sim 3.25\times 10^{-31}$ esu,响应时间 τ 为91~116 fs.探索了化合物的分子结构对三阶非线性光学性能的影响.增长共轭链,形成供吸供构型,增大取代基的供电子能力,提高共轭体系的共平面程度等因素有利于获得较大的三阶非线性光学性能.

关键词: 非线性光学 简并四波混频 蒽二酮类化合物 合成

Synthesis and Relation Between Structure and Optical Nonlinearities of Anthracenedione Compounds

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Abstract:

Six new anthracenedione compounds are

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synthesized and characterized by UV-vis, IR, ¹H NMR and elemental analysis. By using femtosecond laser, the off-resonant third-order optical nonlinearities of the compounds are measured with degenerate four-wave mixing technique. The third-order nonlinear optical susceptibilities $\chi(3)$ are $2.62 \sim 3.55 \times 10^{-13}$. The nonlinear refractive indexes n_2 are $4.82 \sim 6.52 \times 10^{-12}$ esu. The second-order hyperpolarizabilities γ of the molecules are $2.57 \sim 3.25 \times 10^{-31}$ esu. The response times τ are $91 \sim 116$ fs. The influence of the molecular structure on the third-order optical nonlinearity is studied. The factors such as long conjugate chain, formation of donor-acceptor-donor structure, strong electron-donating abilities of substituents, and good coplanarity lead to the high third-order optical nonlinearity.

Keywords: Nonlinear optics Degenerate four-wave mixing Anthracenedione compounds Synthesis

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