

论文  
适用于全光开关的[(C<sub>3</sub>H<sub>7</sub>)<sub>4</sub>N][Au(C<sub>3</sub>S<sub>5</sub>)<sub>2</sub>]三阶非线性光学性质研究

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摘要:

合成了一种金属有机配合物[(C<sub>3</sub>H<sub>7</sub>)<sub>4</sub>N][Au(C<sub>3</sub>S<sub>5</sub>)<sub>2</sub>].配制了浓度为 $1 \times 10^{-3}$  mol/L的[(C<sub>3</sub>H<sub>7</sub>)<sub>4</sub>N][Au(C<sub>3</sub>S<sub>5</sub>)<sub>2</sub>]/乙腈溶液,并用旋涂法制备了掺杂浓度质量比为1%的[(C<sub>3</sub>H<sub>7</sub>)<sub>4</sub>N][Au(C<sub>3</sub>S<sub>5</sub>)<sub>2</sub>]/PMMA复合薄膜.运用Z扫描方法,分别研究了样品溶液和薄膜在波长为1 064 nm,脉宽为20 ps条件下的三阶非线性光学性质.研究发现薄膜的三阶非线性极化率 $\chi^{(3)}$ 比溶液高出三个数量级.其中,薄膜的非线性折射率 $n_2$ 为 $-1.76 \times 10^{-15}$  m<sup>2</sup>/W、三阶非线性极化率 $\chi^{(3)}$ 为 $9.37 \times 10^{-10}$  esu.结果表明,该材料在全光开关方面具有潜在的应用价值.

关键词: 三阶非线性光学性质 全光开关 DMIT类聚合物 Z扫描技术

Third-order Nonlinear Optical Properties Study of [(C<sub>3</sub>H<sub>7</sub>)<sub>4</sub>N][Au(C<sub>3</sub>S<sub>5</sub>)<sub>2</sub>] Applied to All-optical Switches

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Abstract:

A novel novel dmit<sup>2-</sup> salt: [(C<sub>3</sub>H<sub>7</sub>)<sub>4</sub>N][Au(C<sub>3</sub>S<sub>5</sub>)<sub>2</sub>] was synthesized. Its acetonitrile solution with concentration  $1.0 \times 10^{-3}$  mol/L was prepared. The thin film with [(C<sub>3</sub>H<sub>7</sub>)<sub>4</sub>N][Au(C<sub>3</sub>S<sub>5</sub>)<sub>2</sub>]-doped in PMMA was fabricated spin-coating on a quartz substrate. The third-order optical nonlinearities of sample solution and film were investigated by using the laser Z-scan technique with 20 ps pulses width at 1 064 nm. The experimental results show that the third-order nonlinear susceptibility  $\chi^{(3)}$  improves an approximate 3 orders of magnitude by the PrAu film over the solution. The nonlinear refraction coefficient  $n_2$  and the third-order nonlinear susceptibility  $\chi^{(3)}$  of the PrAu film were obtained to be  $1.76 \times 10^{-15}$  m<sup>2</sup>/W and  $9.37 \times 10^{-10}$  esu, respectively. The results suggest that PrAu will be a promising material for all-optical switching devices.

Keywords: Third-order optical nonlinearity All-optical switching DMIT complex Z-scan technique

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