

## 论文

### Zn : Mn : Fe : LiNbO<sub>3</sub>晶体位相共轭性能和全息关联存储

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#### 摘要:

在同成分LiNbO<sub>3</sub>中,掺入ZnO的摩尔分数分别为1%、3%、5%、7%和9%,掺入(质量分数)0.03% MnCO<sub>3</sub>和0.08%Fe<sub>2</sub>O<sub>3</sub>,采用提拉法生长了优质Zn : Mn : Fe : LiNbO<sub>3</sub>晶体.测试Zn : Mn : Fe : LiNbO<sub>3</sub>晶体的OH-红外吸收光谱,抗光损伤能力和位相共轭性能.Zn离子浓度在7%和9%时,OH-吸收峰移到3 528 cm<sup>-1</sup>,讨论OH-吸收峰移动机理.随着Zn离子浓度增加,抗光损伤能力增加.Zn离子浓度增加到7%,达到阈值.Zn : Mn : Fe : LiNbO<sub>3</sub>晶体抗光损伤能力比LiNbO<sub>3</sub>晶体高二个数量级,研究高掺锌Mn : Fe : LiNbO<sub>3</sub>晶体抗光损伤增强机理.随着Zn离子浓度增加,Zn : Mn : Fe : LiNbO<sub>3</sub>晶体位相共轭反射率降低,位相共轭响应速度增加.Zn : Mn : Fe : LiNbO<sub>3</sub>晶体位相共轭镜消除了光波的位相畸变.以Zn : Mn : Fe : LiNbO<sub>3</sub>晶体作存储介质进行全息关联存储实验.讨论全息关联存储的工作原理.以原图象的25%和50%进行寻址,在输出平面上接收到较完整的存储图象.

**关键词:** Zn : Mn : Fe : LiNbO<sub>3</sub>晶体 位相共轭性能 全息关联存储

### Phase Conjugation Properties and Holographic Associative Storage of Zn : Mn : Fe : LiNbO<sub>3</sub> Crystals

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#### Abstract:

Zn : Mn : Fe : LiNbO<sub>3</sub> crystals with 1%,3%,5%,7% and 9%,ZnO(in mole) and MnCO<sub>3</sub> and Fe<sub>2</sub>O<sub>3</sub>,added at concentration of 0.03%and 0.08(in mass)respectively,were grown by Czochralski method from congruent LiNbO<sub>3</sub> melting.The OH- infrared absorption spectra,the optical damage resistance and phase conjugate properties of Zn : Mn : Fe : LiNbO<sub>3</sub> crystals were tested.When Zn<sup>2+</sup> concentration reaches 7% and 9%,OH- absorption peaks shift to 3 528 cm<sup>-1</sup>.The mechanism of OH-1 absorption peaks shift were discussed.The optical damage resistance ability of Zn : Mn : Fe : LiNbO<sub>3</sub> crystals increase,with the increase of Zn<sup>2+</sup> concentration.When Zn<sup>2+</sup> concentration reaches to 7% (reaches threshold value),the optical damage resistance ability are two orders of magnitude higher than that of LiNbO<sub>3</sub> crystals.The enhancement mechanism of optical damage resistance of highly doping zinc Mn:Fe:LiNbO<sub>3</sub> crystals was researched.The bphase conjugate reflectivity decreases and phase conjugate response speed increases,with the increase of Zn<sup>2+</sup> concentration.The phase conjugate mirror has eliminate optical wave phase distortion.The holographic associative storage experiment was carried out using Zn : Mn : Fe : LiNbO<sub>3</sub> crystals as storage medium.The working principle of holographic associative storage was discussed.Using 25% and 50% addressing,the intact storage image was received in output plane.

**Keywords:** Zn : Mn : Fe : LiNbO<sub>3</sub> crystals Phase conjugation properties Holographic associative storage

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