Study on Electro-optic Q Switch of La₃Ga₅SiO₁₄ Single Crystal

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Abstract  By simulating the Q-switch process of the optical activity crystals in the laser cavity, the experiment setup for studying the electro-optic effect of the optical activity crystals is designed. The phenomenon of interference of the optical activity crystals in the perpendicular polarized light and the parallel polarized light is studied. The optimum configuration for the optical activity crystals to be used as the electro-optic Q-switch in the laser cavity is obtained, and the electro-optic Q-switch is made by using the typically optical activity crystal La₃Ga₅SiO₁₄ successfully.

Key words  physical optics; optical activity; electro-optic effect; polarized light interference; electro-optic Q-switch
Fig. 1 Experiment setup (No. 1) for studying the electro-optic property of optical activity crystals.

\[ x \times y \times z = 8 \text{ mm} \times 9 \text{ mm} \times 55 \text{ mm} \]

LGS 1:130.

V, LGS 1:60.

LGS 1:5.

LGS Q

\( \lambda/4 \)

LGS Q

2.2 (2)

Fig. 2 Experiment setup (No. 2) for studying the electro-optic property of optical activity crystals.

2.3 (3)

LGS LN 4

LN

LGS

LGS Q

LN

LGS Q

\( \lambda = 1.083 \mu \text{m} \), \( \Delta n = n_e - n_o = 1.89156 - 1.88021 = 0.01135 \)

LGS LN 5

LGS LN

5(b)

LGS
3. He-Ne laser light interferogram of the optical activity crystal for He-Ne laser two times passing through the crystal

(a) the analyzer is perpendicular to the polarized direction of the laser;
(b) the analyzer is parallel to the polarized direction of the laser

4. LGS (a) and LN (b) light interferogram of optical activity crystal LGS in perpendicular polarized light (a) and non optical activity crystal LN in parallel polarized light (b)

5. LGS (a) and LN (b) light interferogram of optical activity crystal LGS (a) and non optical activity crystal LN (b) in parallel polarized light when the half-wave voltage is applied on the sample
将激光腔中的平行偏光干涉转换为正交偏光干涉后成为一平面偏振光，其波长为

\[ \lambda \]

振方向与入射前相同。

晶体后

只是位相改变了

单晶在

波片

出射

其偏光干涉

只是位相改变了

单晶在

开关使用的构图

图

当电压升至半波电压

左旋和右旋圆偏振光的旋转方向分别与

是实现

将正

激光器

波片

开关处于关门状态

在

电光

制作电光

对旋光晶体在正交偏光和平行偏光干涉实

得到了旋光晶体在激光腔中

光

测量输出激光的稳定度为

7.8 ns.

DKDP

Q

8 ns.

EPM-1000

100 Hz

350 mJ. 5 Hz

Fig. 7 Light spot of emitted laser using the electro-optic Q-switch of LGS single crystal

(a) near field (b) far field


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