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Electro-optic crystals

电光晶体

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Foreword

This document conforms to GB/T 1.1-2020 "Standardization Work Guidelines Part

1.Structure and Drafting Rules of Standardization Documents". Drafting is scheduled. Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents. This document was proposed by the China Building Materials Federation. This document is under the jurisdiction of the National Technical Committee on Standardization of Artificial Lenses (SAC/TC 461). This document was drafted by: Fujian Institute of Research on the Structure of Matter, Chinese Academy of Sciences; Mindu Innovation Laboratory; and Fujian Fujing Technology Co., Ltd. Sichuan Normal University, Sinoma Artificial Crystal Research Institute Co., Ltd., Beijing Sinoma Artificial Crystal Research Institute Co., Ltd., Xinjiang Institute of Physics, Chinese Academy of Sciences Chemical Technology Research Institute, 26th Research Institute of China Electronics Technology Group Corporation, Aerospace Information Research Institute of Chinese Academy of Sciences, Jinan Jingzhong Optoelectronics Electric Technology Co., Ltd., Shanghai Ruilike Information Technology Co., Ltd., Shanghai Institute of Ceramics, Chinese Academy of Sciences, Nankai University, Chongqing Yungong Optoelectronics Technology Co., Ltd., Meishan Boya New Materials Co., Ltd., and Southwest Institute of Technical Physics. The main drafters of this document are. Wang Shuaihua, Zheng Yi, Huang Xin, Zheng Fakun, Cao Liling, Wu Shaofan, Zhang Ge, Zhang Xing, Sun Jun, Chen Jianrong, and Huang Cunxin. Ding Yuchong, Wang Chengqiang, Chen Min, Xu Xieming, Xu Liuwei, Jiang Xiliang, Guo Guangyan, Liu Ziqi, Yang Shutong, Yin Changzhi, Wang Ying, Zheng Li, Zhu Yong, Yue Shihai Zhang Wei. Electro-optic crystal

1.Scope This document specifies the technical requirements, inspection rules, and product labeling, packaging, transportation, and storage for electro-optic crystals, and describes the corresponding... Measurement methods. This document applies to electro-optic crystals used in the fabrication of electro-optic devices; crystal materials used in other application areas can refer to this document for further information.

1 Scope

GB/T 47601-2026 is the Chinese national standard covering electro-optic crystals - lithium niobate and its relatives, whose refractive index changes with an applied field, which is how a laser beam is modulated, switched or Q-switched. It fixes the types and grades, the optical quality and homogeneity, the electro-optic coefficients, the damage threshold, the dimensions and the inspection. First edition, published with GB/T 47598-2026 on acousto-optic crystals. It was issued on 25 May 2026 and takes effect on 1 December 2026, as a first edition. The document is under the responsibility of the China Building Materials Federation. This page is published from the official record of the 2026 edition; the clause text of a standard this recent is not yet in circulation, and the figures, limits and tables it contains are those of the document itself, delivered in full with the English translation.

4.10 Angle deviation The cutting angle deviation of the electro-optic crystal should meet the following requirements. -0.5°<=Deltatheta<=0.5°, -0.5°<=Deltaphi<=0.5°.

Note. theta refers to the angle between the normal direction of the crystal cutting plane and a certain reference crystal axis of the crystal, and Deltatheta is the difference between the actual cutting angle theta and the theoretical design value. phi refers to the angle between the projection of the normal to the cut surface onto a reference crystal axis in a plane perpendicular to the reference crystal axis; Deltaphi refers to the angle between the actual cut phi angle and the theoretical angle. Discuss the difference in design values.

4.11 Parallelism The parallelism between the two light-transmitting surfaces of an electro-optic crystal should be <=30".

4.12 Chamfering The width of the chamfer is <=

0.2 mm, and the angle of the chamfer is 40°<=Phi<=50°.

4.13 Side perpendicularity The side perpendicularity of the electro-optic crystal should be <=10'.

4.14 Effective aperture The effective aperture is the ratio of the usable area of the light-transmitting surface of an electro-optic crystal after deducting the chamfered edges to the total area of the light-transmitting surface; it should be >= 85%.

4.15 Single-pass wavefront distortion The single-pass transmission wavefront distortion of an electro-optic crystal should be <=lambda/4@632.8 nm.

4.16 Surface Roughness The surface roughness Ra of the light-transmitting surface of the electro-optic crystal is <=1 nm; the surface roughness Ra of the non-light-transmitting surface is <=3.0 μm.

4.17 Appearance The width of the electro-optic crystal extending inward from the edge (radial chipping) is <=

0.2 mm; the sum of the chipping widths along the edge direction is <=

0.5 mm; Corner chipping <=

0.2 mm. Surface defects of electro-optic crystal components should meet the requirements of Table 2.

4 Technical Requirements

4.1 Static extinction ratio When applicable, the static extinction ratio of electro-optic crystals should meet the following requirements.

a) The static extinction ratio of lithium niobate (LN) should be >=200:1;

b) The static extinction ratio of potassium dideuterium phosphate (DKDP) should be >=200.1;

c) The static extinction ratio of titanium oxy rubidium (RTP) should be >=200:1;

d) The static extinction ratio of potassium titanium phosphate (KTP) should be >=300:1;

e) The static extinction ratio of lithium tantalate (LT) should be >=200.1;

f) The static extinction ratio of beta-phase barium metaborate (beta-BBO) should be >=800:1;

g) The static extinction ratio of lanthanum gallium silicate (LGS) should be >=400:1;

h) Other electro-optic crystals can be used as a reference.

4.2 Half-wave voltage When applicable, the half-wave voltage of the electro-optic crystal should meet the following requirements.

a) The half-wave voltage of LN is <=

3.0 kV (1064 nm, transverse modulation);

b) The half-wave voltage of the DKDP should be <=

7.0 kV (1064 nm, longitudinal modulation).

5 Measurement Methods

5.1 Static extinction ratio The static extinction ratio test of electro-optic crystals shall be

conducted in accordance with the provisions of GB/T 11297.12-2012.

5.2 Half-wave voltage

5.2.1 Measurement Principle By adjusting the polarization directions of the polarizer and analyzer, and applying a driving voltage, the birefringence of the electro-optic crystal changes, thereby causing the output... When the output optical power changes from minimum to maximum, the corresponding voltage change is the half-wave voltage.

5.2.2 Measuring Instruments Laser source, polarizer, analyzer, laser power meter, drive power supply.

5.2.3 Measurement Procedure The measurement steps are as follows:

a) Connect the relevant instruments as shown in Figure 2, connect the electro-optic crystal to the optical path, connect the drive power supply, and turn on the equipment to preheat for 10 minutes;

b) Adjust the polarizer and analyzer to be parallel in polarization direction so that the laser power meter displays the maximum value, and then fix the polarizer.

c) The polarization direction of the rotating analyzer is perpendicular to the polarizer, and the electro-optic crystal is in its extinction state without applied voltage. At this point, the light intensity is minimum, and the laser power is... The recorded optical power is P1;

d) Keeping the optical path system unchanged, turn on the high-voltage output switch of the driver power supply and slowly increase the output voltage of the driver power supply to the output optical path. When the power is at its maximum, the optical power recorded by the laser power meter is P0, and the output voltage V0 recorded by the drive power supply is the half-wave voltage.

e) Take the average value of 5 tests. The test interval is specified in the relevant detailed specifications.

5.3 Transmission Spectral Range The method for measuring the transmission spectral range of electro-optic crystals shall comply with the provisions of GB/T 22453-2025.

5.4 Scattering Points The method for measuring the scattering point of an electro-optic crystal shall comply with the provisions of GB/T 22452-2025.

5.5 Optical uniformity The optical uniformity test method for electro-optic crystals shall comply with the provisions of GB/T 22452-2025.

5.6 Insertion Loss

5.6.1 Measurement Principle Insertion loss refers to the ratio of output optical power to input optical power after an electro-optic crystal is introduced into the optical path. The insertion loss is given by formula (1).