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Optique et photonique — Matériaux et composants optiques — Méthodes d'essai pour déterminer l'homogénéité des matériaux optiques infrarouges

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Foreword

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This document was prepared by Technical Committee ISO/TC 172, *Optics and photonics*, Subcommittee SC 3, *Optical materials and components*.

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Optics and photonics — Optical materials and components — Test method for homogeneity of infrared optical materials

1 Scope

This document specifies the principle, apparatus, condition, sample, procedure and data processing of measuring homogeneity of infrared optical materials.

It is applicable to the determination of homogeneity of infrared optical materials, such as infrared optical glass, infrared crystals and infrared ceramics, which are opaque to visible wavelengths and whose transmission optical spectra are beyond 0,78 µm.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 10110-7, *Optics and photonics — Preparation of drawings for optical elements and systems — Part 7: Surface imperfections*

ISO 10110-8, *Optics and photonics — Preparation of drawings for optical elements and systems — Part 8: Surface texture; roughness and waviness*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
peak-to-valley value of refractive index
PV value
Δn_{PV}
difference between the maximum and the minimum values of refractive index distribution of an infrared optical material in its cross-sectional area of the definition area

3.2
standard deviation value of refractive index
Δn_{STD}
value which is expressed with the square root of the sum of the squares of the differences of both the distribution values and the average value of refractive index of an infrared optical material divided by the sampling number of the distribution

3.3
homogeneity
gradual variation of the refractive index distribution within an optical element in the prescribed direction (mostly perpendicular to optical path) and within the prescribed cross-section

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3.4
homogeneity value
level of inconsistency of the refractive index distribution of an infrared optical material in the prescribed direction (mostly perpendicular to optical path) and within the prescribed cross-sectional area and per unit thickness of infrared optical materials, which is expressed in the PV value and the *standard deviation value of refractive index* (3.2)

4 Principle

For a wedge-shaped sample, measure with a digitalized infrared interferometer the wavefront interferograms of the front surface and the rear surface of the sample. Then measure the interferogram of the wavefront going forth and back through the sample in a double pass configuration. Repeat the double pass measurement without the sample in the measurement. Calculate the PV value and the standard deviation value of infrared refractive index (simply called four-step method).

For a plane parallel plate sample, separately measure the wavefront interferograms in a double pass configuration with and without the sample in the test cavity. Calculate the PV value and the standard deviation value of infrared refractive index (simply called two-step method). The schematic diagram of the measurement of homogeneity is shown in Figure 1.

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