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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 47066-2026

**Plastics - Determination of the total luminous transmittance
and reflectance**

塑料 总透光率和总反射率的测定

(English Translation)

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Table of Contents

Foreword
1 Scope
2 Normative references
3 Terms and definitions
4 Method overview
5 Apparatus
6 Specimen
7 Conditioning
8 Procedure
9 Calculation
10 Precision
11 Test report
Annex A (informative) Example of measurement of total luminous transmittance and Total luminous reflectance
Annex B
Bibliography

1 Scope

This document describes methods for the determination of total luminous transmittance and total luminous reflectance of clear, translucent, or opaque plastics.

This document applies to square or round moulded specimens, films, and sheets.

This document does not apply to plastics containing fluorescent agents or colorants.

NOTE: GB/T 46828.1 applies to near-colorless, planar transparent plastics. This document provides methods for trapping scattered light and extends its application to the determination of total luminous transmittance and total luminous reflectance of translucent and opaque plastics.

2 Normative references

The following referenced documents are indispensable for the application 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.

GB/T 2918 Plastics - Standard atmospheres for conditioning and testing (GB/T 2918-2018,

ISO 291:2008, MOD) ISO/CIE 11664-1 Colorimetry - Part 1: CIE standard colorimetric observers ISO/CIE 11664-2 Colorimetry - Part 2: CIE standard illuminants

3 Terms and definitions

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

total luminous transmittance t_{tot} Ratio of the transmitted luminous flux to the incident luminous flux when a parallel light beam passes through a specimen.

total luminous reflectance ρ_{tot} Ratio of the reflected luminous flux to the incident luminous flux when a parallel light beam reflected on a specimen.

4 Method overview

When calculating the total luminous transmittance of a light-diffusing material, the scattered light propagates towards the edge of the specimen due to its light-diffusing properties. This method aims to collect the scattered light propagating towards the edge of the specimen using an integrating sphere. This method is applicable not only to light-diffusing materials but also to transparent materials.

This method can also evaluate the total luminous reflectance of clear, translucent, or opaque materials.

NOTE: When evaluating specimens with almost zero light absorption (such as milky white PMMA), the sum of total luminous transmittance and total luminous reflectance is 100 % or close to 100 %.

5 Apparatus

5.1

The apparatus shall include a stable light source, a related optical system, an integrating sphere with ports, and a photometer. The photometer shall include a photodetector, a signal processor, and a display unit or recorder (see Figure 1).

5 - incident light.

Figure 1 -- Apparatus (integrating sphere and ports)

5.2

The light source and photometer shall be used in conjunction with a filter to provide an output luminous efficacy corresponding to the photopic standard luminous efficacy $V(\lambda)$ (as defined in ISO/CIE 11664-1), which is identical to the color matching function $y(\text{avg})(\lambda)$ (as specified in ISO/CIE 11664-1) under the CIE standard illuminant D65 (as specified in ISO/CIE 11664-2). The output of the photodetector within the luminous flux range used shall be proportional to the incident luminous flux, with a deviation between the two within 1 %. During the measurement process, the spectral characteristics

of the light source and photodetector shall be kept constant.

5.3

The total area of the ports (the sum of area of the ports a, b, c, and d) shall not exceed 4.0 % of the internal reflective surface area of the sphere. The diameter of the integrating sphere should preferably be not less than 150 mm to ensure that the scattered light is sufficiently focused along the thickness direction of the specimen.

5.4 Ports a, b, and c shall be located on the same great circle of the sphere. The angle

between lines ac and bc shall be 14° . Line ac refers to the line connecting the center of port c and the center of port a, and line bc refers to the line connecting the center of port b and the center of port c. Port d shall not be located on the great circle containing ports a, b, and c within the sphere.

5.5 The light source and related optical system shall produce a parallel light beam, the angle between the ray and the beam axis of which shall not exceed 0.05 rad (3°). The center of the luminous flux shall be precisely aligned with the center of port a. The cross-section of the luminous flux shall be circular and produce a clear image. The diameter of the luminous flux of port a shall be 0.5 to 0.6 times that of the specimen, except for the reflectance assessment of opaque specimens.

5.6 The standard white plate covering port c shall have uniform high reflectance across the entire visible light spectrum. The standard white plate can be made of barium sulfate or polytetrafluoroethylene (PTFE). The inner wall of the integrating sphere shall be coated with a coating of the same reflectance as a standard white plate.

5.7 The light trap installed in port b or port c shall absorb all light when no specimen or standard white plate is installed in port b or port c.

5.8 When the specimen has high haze and a large thickness, the specimen shape shall

be circular and installed in the specimen holder shown in Figure 2. The inner surface of the specimen holder shall have metallic luster, because the holder collects scattered light propagating towards the edge of the specimen.

taut - the total luminous transmittance, %;

rhot - the total luminous reflectance, %;

tau1 - the standard incident luminous flux;

tau2 - the transmitted luminous flux;

tau3 - the incident luminous flux of the light trap;

τ_4 - the reflected luminous flux.

NOTE: The derivations of formulas (1) and (2) is given in Annex B.

Total luminous transmittance and total luminous reflectance are expressed as the average value of the test results of three specimens, with the results rounded off to one decimal place, and shall be expressed as shown in the following example.

Example. $\tau_{\text{aut}} = 60.2 \%$, $\rho_{\text{hot}} = 39.5 \%$

10 Precision

At the time of publication of this document, interlaboratory test data complying with GB/T 6379.2 have not yet been obtained. Example of measurement of total luminous transmittance and total luminous reflectance are given in Table A.1 of Annex A.

11 Test report

The test report shall include at least the following.

- a) a reference to this document;
- b) name, type, thickness, dimensions, and shape of specimens;
- c) test results (total luminous transmittance, total luminous reflectance, or both);
- d) test surface, if the property or appearance of the two surfaces of the specimen differ;
- e) average value of the test results for three specimens;
- f) equipment model and manufacturer;
- g) other precautions beyond the scope of this document;
- h) test date.

Annex A

(informative)

Example of measurement of total luminous transmittance and total luminous reflectance
A.1 Characteristics of this method when evaluating light-diffusing materials such as translucent plastics used for the cover of lighting fixture according to GB/T 46828.1, the test results are often lower than the actual performance due to the efficiency of the integrating sphere or edge loss. The purpose of this document is to maximize the efficiency of the integrating sphere and minimize edge loss.

NOTE: Edge loss refers to the scattering of light from the edges of the specimen.

The smaller the opening ratio (the ratio of the opening area to the internal area of the integrating sphere) of the integrating sphere, the higher its efficiency.