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

GB/T 42919.4-2023

**Plastics - Determination of thermal conductivity and thermal
diffusivity - Part 4: Laser flash method**

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Foreword

This document is drafted in accordance with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1. Structure and Drafting Rules of Standardization Documents".

This document is Part 4 of GB/T 42919 "Determination of Thermal Conductivity and Thermal Diffusion Coefficient of Plastics". GB/T 42919 has been issued

The following parts have been published.

---Part 1. General principles;

---Part 3. Temperature wave analysis method;

---Part 4. Laser flash method;

---Part 6. Comparative method based on temperature modulation technology.

This document has been modified to adopt ISO 22007-4:2017 "Determination of thermal conductivity and thermal diffusion coefficient of plastics - Part 4. Laser flash method".

Compared with ISO 22007-4:2017, this document has made the following structural adjustments.

---Chapter 12 corresponds to Chapter 11 in ISO 22007-4:2017;

---Appendix A corresponds to Appendix B in ISO 22007-4:2017, Appendix B corresponds to Appendix C in ISO 22007-4:2017, Appendix

C corresponds to Appendix A in ISO 22007-4:2017.

The technical differences between this document and ISO 22007-4:2017 and their reasons are as follows.

--- Added normative references to GB/T 2035 (see Chapter 3) to adapt to my country's technical conditions;

---Replaced ISO 22007-1 (see Chapter 3) with the normatively cited GB/T 42919.1 to adapt to my country's technical conditions;

---Deleted the furnace temperature range adjustment method (5.2 of ISO 22007-4.2017) to adapt to my country's technical conditions;

---Replaced ISO 291 (see Chapter 6) with the normatively cited GB/T 2918 to adapt to my country's technical conditions;

---Deleted the situation when the infrared detector cannot be calibrated (7.1 of ISO 22007-4.2017) to adapt to my country's technical conditions;

---Added "9.2 Result Expression" to clarify the result requirements;

---Replaced ISO /IEC Guide98-3 (see Chapter 10) with the normatively quoted GB/T 27418 to adapt to my country's technical conditions;

---Replaced ISO 2818 with normatively cited GB/T 39812, and GB/T 1040.1 replaced ISO 527-1 (see appendix

B), to adapt to my country's technical conditions;

---Added "Chapter 11 Precision".

The following editorial changes have been made to this document.

---Added the calculation formula of thermal conductivity λ to the note (see Chapter 4);

---Adjust the content of Note 2 of 6.2 in ISO 22007-4.2017 to the main text (see 6.2);

--- Added informative references to GB/T 6379.2 (see Appendix D);

---Added Appendix D (informative) "Precision data of thermal diffusivity tested by multiple laboratories".

Please note that some content in this document may be subject to patents. The publisher of this document assumes no responsibility for identifying patents.

Introduction

The laser flash method is targeted in parameter settings, calculation methods and sample preparation based on the performance characteristics of different plastics and composite materials.

Stronger, it is of great significance to improve the accuracy of thermal diffusivity testing of plastic materials.

GB/T 42919 describes various methods for determining the thermal conductivity and thermal diffusion coefficient of plastics based on different principles. It is planned to consist of six parts.

---Part 1.General principles. The purpose is to establish common definitions and methods for measuring thermal conductivity and thermal diffusivity.

content.

---Part 2.Transient plane heat source (hot plate) method. The purpose is to determine the transient plane of the thermal conductivity and thermal diffusivity of plastics.

Heat source (hot plate) method establishes operable, traceable, and verifiable procedures.

---Part 3.Temperature wave analysis method. The purpose is to establish a temperature wave analysis method for measuring the thermal conductivity and thermal diffusion coefficient of plastics.

Actionable, traceable, and verifiable procedures.

---Part 4.Laser flash method. The purpose is to establish an operable method for the laser flash method to determine the thermal conductivity and thermal diffusion coefficient of plastics.

operational, traceable, and verifiable procedures.

---Part 5.Interlaboratory test results of polymethylmethacrylate samples. The purpose is to conduct polymethylpropylene testing through multiple laboratories.

The thermal conductivity and thermal diffusion coefficient of methyl olefinate are measured and test data are provided.

---Part 6.Comparative method based on temperature modulation technology. The purpose is to provide a method for determining the ratio of low thermal conductivity using temperature modulation techniques.

Compare laws and establish operable, traceable and verifiable procedures.

Determination of thermal conductivity and thermal diffusion coefficient of plastics

Part 4.Laser flash method

1 Scope

This document describes a method for determining the thermal diffusivity in the thickness direction of plastic sheets using the laser flash method.

This document applies to homogeneous solid plastics as well as composite materials with isotropic or orthotropic structures.

This method is suitable for use in gas or vacuum environments of -100 degrees C~400 degrees C with a thermal diffusion coefficient of $1 \times 10^{-7} \text{ m}^2 \text{ s}^{-1}$ ~ $1 \times$

$10^{-4} \text{ m}^2 \text{ s}^{-1}$ of material.

Note. For non-uniform samples, the measured value may be affected by the thickness of the sample.

2 Normative reference documents

The contents of the following documents constitute essential provisions of this document through normative references in the text. Among them, the dated quotations

For undated referenced documents, only the version corresponding to that date applies to this document; for undated referenced documents, the latest version (including all amendments) applies to

this document.

GB/T 1040.1 Determination of tensile properties of plastics Part 1.General (GB/T 1040.1-2018, ISO 527-1.2012, IDT)

GB/T 2035 Plastic terms and definitions (GB/T 2035-2008, ISO 472.1999, IDT)

GB/T 2918 Standard environment for conditioning and testing of plastic specimens (GB/T 2918-2018, ISO 291.2008, MOD)

GB/T 27418 Evaluation and expression of measurement uncertainty (GB/T 27418-2017, ISO /IEC Guide98-3.2008, MOD)

GB/T 39812 Machining preparation of plastic specimens (GB/T 39812-2021, ISO 2818.2018, IDT)

GB/T 42919.1 Determination of thermal conductivity and thermal diffusivity of plastics Part 1.General principles (GB/T 42919.1-2023,ISO 22007-1.2017,MOD)

3 Terms and definitions

The following terms and definitions as defined in GB/T 2035 and GB/T 42919.1 apply to this document.

3.1

pulse width pulsewidth

tp

The duration during which the laser pulse intensity is greater than half of its maximum value.

Note. The unit is seconds (s).

3.2