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

GB/T 42919.3-2023

**Plastics - Determination of thermal conductivity and thermal
diffusivity - Part 3: Temperature wave analysis method**

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Foreword

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

Drafting.

This document is Part 3 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 is modified to adopt ISO 22007-3:2008 "Determination of thermal conductivity and thermal diffusion coefficient of plastics - Part 3. Temperature wave analysis method".

Compared with ISO 22007-3:2008, this document has made the following structural adjustments.

---Chapter 5 corresponds to 5.1~5.3 in ISO 22007-3:2008;

---6.8 corresponds to 7.3 in ISO 22007-3:2008;

---8.3~8.9 corresponds to 8.4~8.10 in ISO 22007-3:2008;

---Appendix B corresponds to Appendix D in ISO 22007-3:2008, and Appendix D corresponds to Appendix B in ISO 22007-3:2008.

The technical differences between this document and ISO 22007-3:2008 and their reasons

are as follows.

---Replaced ISO 472 (see Chapter 3) with normatively quoted GB/T 2035 to adapt to my country's technical conditions and increase operability

work nature;

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

Increase operability;

---Added the requirement that the temperature measuring device has an accuracy of at least $\pm 0.3\text{K}$ (see 6.7);

---Deleted liquid samples (see 7.1 and 8.3 of ISO 22007-3:2008) because it is impossible to verify whether this document is applicable to liquids

specimen;

---Added the requirement to conduct a parallel test (see 8.10);

--- Added the requirement that the test result be the average of two repeated test results (see 9.6) to clarify the calculation method of the test results;

---Replaced ISO /IEC Guide98-3 (see 11.1) with normatively quoted GB/T 27418 to adapt to my country's technical requirements

parts to increase operability;

---The repeatability data has been changed from 1% to 5% (see 11.2), based on the test results measured by our country's laboratory to adapt to our country's

technical conditions.

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 thermal conductivity properties of plastics are indispensable in the plastics industry and other fields. When plastics are used in various new applications, such as nano

Technology and biomedicine require simple, small-scale tests that can be performed quickly and accurately. Temperature wave analysis is a method of testing the thermal diffusion coefficient of thin specimens

This method is also suitable for small samples.

GB/T 42919 "Determination of Thermal Conductivity and Thermal Diffusion Coefficient of Plastics" is intended 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 3.Temperature wave analysis method

1 Scope

This document describes a method for determining the thermal diffusivity in the thickness direction of plastic films and sheets using temperature wave analysis.

This document applies to plastics with isotropic or anisotropic structures whose thermal diffusion coefficient α ranges from $1.0 \times 10^{-8} \text{ m}^2 \cdot \text{s}^{-1}$ to $1.0 \times$

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

The tests specified in this document can be carried out in air or other gases, such as inert gases; at atmospheric pressure or other low, high or true pressures.

It can be carried out under air; it can be carried out at different temperatures.

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

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

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)

ISO 80000-5 Quantities and units Part 5.Thermodynamics (Quantitiesandunits-Part 5.Thermodynamics)

3 Terms and definitions

The following terms and definitions as defined in GB/T 2035, GB/T 42919.1 and ISO 80000-5 apply to this document.

3.1

temperature wavetemperaturewave

Temperature oscillations produced by modulated power heat sources.

3.2

phaseshiftphaseshift

deltatheta

The phase difference of the surface temperature wave before and after the sample.

NOTE. Delay is defined as negative phase shift.

4 symbols

The following symbols apply to this document.