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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 42919.6-2023

Plastics - Determination of thermal conductivity and thermal diffusivity - Part 6: Comparative method for low thermal conductivities using a temperature-modulation technique

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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 6 of GB/T 42919 "Determination of Thermal Conductivity and Thermal Diffusion Coefficient of Plastics". GB/T 42919 has been released

The following parts.

---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 using ISO 22007-6.2014 "Determination of thermal conductivity and thermal diffusivity of plastics - Part 6.Based on temperature adjustment"

Comparative approach to manufacturing technology.

Compared with ISO 22007-6.2014, this document has made the following structural adjustments.

---The sixth and seventh paragraphs of Chapter 4 correspond to the second and third paragraphs of Chapter 1 of ISO 22007-6.2014;

---5.1 corresponds to the introductory words of ISO 22007-6.2014 Chapter 5, and then 5.2~5.6 corresponds to 5.1~ in ISO 22007-6.2014

5.5;

---The items listed in 5.3 correspond to 5.2.1~5.2.3 in ISO 22007-6.2014;

---The second paragraph of 5.4 corresponds to 6.2 in ISO 22007-6.2014;

---6.1 and 6.2 correspond to 6.3 and 6.4 in ISO 22007-6.2014.

The technical differences between this document and ISO 22007-6.2014 and their reasons are as follows.

---Deleted the fourth and sixth paragraphs in Chapter 1 of ISO 22007-6.2014 because they do not fall within the scope;

---Replaced ISO 472 and GB/T 42919.1 with normatively cited GB/T 2035 to replace ISO 22007-1 (see Section 3

Chapter) to adapt to my country's technical conditions and increase operability;

---Replaced ISO 22007-3 (see Chapter 3 and Chapter 4) with the normatively quoted GB/T 42919.3 to adapt to my country's technical conditions

parts to increase operability;

---Deleted 6.1 in ISO 22007-6.2014 because it does not fall within the requirements for specimens;

---Changed the requirements for reporting information in Chapter 9 "Test Report" of ISO 22007-6.2014 to adapt to my country's technical conditions.

The following editorial changes have been made to this document.

---Change the calculation formulas in the terms and definitions of "Gain", "Thermal Penetration Depth" and "Thermal Diffusion Length" to the content of Note;

---Added the calculation formula and explanation of the relevant symbols of "kd < < 1" in the third paragraph of Chapter 4;

---Changed "Figure 2 and Figure 3" in 5.2.3 in ISO 22007-6.2014 to "Figure 1 and Figure 2" in column 5.3 of this document because

ISO 22007-6.2014 mentions errors;

---Changed the last sentence of Note 6.2 in ISO 22007-6.2014 as the recommended clause "Probe" in 5.4 of this document

The thermal conductivity should be similar to that of the sample" (see 5.4, note of 6.2 in ISO 22007-6.2014).

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 insulation properties of plastics are particularly important in certain areas.

Microscale thermal conductivity design of plastics requires a test method that is suitable for

Suitable for testing on smaller sizes using a small number of samples (such as food trays, thermal printing films, gel sheets of internal electrical components of laptops, adhesives, etc.)

A relatively low thermal conductivity [such as less than 1.0W/(m.K)]. This paper proposes a highly sensitive thermopile dual-sensor system that

The sensors of the system are located at different distances from the modulated temperature field and are controlled by the Peltier thermal module. The conductivity of the plastic is obtained by measuring the attenuation of the temperature wave.

thermal coefficient.

Compared with pulse method or transient method, temperature modulation technology has the characteristics of high sensitivity and high temperature resolution. The use of lock-in amplifier can reduce

Less noise and interference.

This document specifies a modulated temperature method to determine the thermal conductivity with small temperature changes, thereby integrating the effects of radiation and convection.

noise to a minimum.

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 6.Comparative method based on temperature modulation technology

1 Scope

This document describes a temperature modulation method for determining thermal conductivity, with input temperature deviations less than 1 K, using the double phase locking method to amplify tiny

temperature modulation.

This document applies to plastic materials with thermal conductivity coefficients of 0.026W/(m.K)~0.6W/(m.K).

Note. Appendix A gives the thermal conductivity test conditions and test results of two types of foam plastics.

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 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)