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Plastics — Differential scanning calorimetry (DSC) —

Part 8: Determination of thermal conductivity

Plastiques — Analyse calorimétrique différentielle (DSC) —

Partie 8: Détermination de la conductivité thermique

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 5, *Physical-chemical properties*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 249, *Plastics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 11357 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The advantage of using DSC for measuring the thermal conductivity of plastics is that with the same instrument also the specific heat capacity can be obtained. This enables the determination of the thermal diffusivity by dividing the thermal conductivity by the density and specific heat capacity.

In addition, DSC instruments are widely used and available in almost all test institutes and labs. Hence, measurements of thermal conductivity can be done without need for procurement of an additional instrument.

Plastics — Differential scanning calorimetry (DSC) —

Part 8: Determination of thermal conductivity

1 Scope

This document establishes a method for determination of the thermal conductivity of solid unfilled and filled or fibre reinforced plastics and composites by means of differential scanning calorimetry (DSC).

It is applicable for materials with thermal conductivities of up to 1 W/(m·K).

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 291, *Plastics — Standard atmospheres for conditioning and testing*

ISO 472, *Plastics — Vocabulary*

ISO 6344-1, *Coated abrasives — Grain size analysis — Part 1: Grain size distribution test*

ISO 11357-1, *Plastics — Differential scanning calorimetry (DSC) — Part 1: General principles*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472 and ISO 11357-1 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/

4 Principle

For the determination of thermal conductivity, the usual placement of the specimen in the sample holder position is modified according to a procedure proposed in References [1] and [2] Additional details on scientific background, deduction of results and performance of measurements can be found in References [3] and [4].

An empty crucible is placed in the reference position of the sample holder assembly. The test specimen is placed directly onto the sensor of the sample position and a crucible containing a substance of known melting temperature is put on top of the specimen (see Figure 1). The thermal conductivity is measured at a temperature slightly above the melting point of this substance in the small temperature range in which the slope of the melting peak with test specimen is determined (see 9.4, Figure 2).

Upon heating, a temperature gradient is created in the specimen. The temperature of the top of the specimen remains constant at the melting temperature T_m of the melting substance while the temperature of the bottom side of the specimen corresponds to the temperature of the sample side