
Rubber, vulcanized — Determination of the glass transition temperature and enthalpy by differential scanning calorimetry

*Caoutchouc vulcanisé — Détermination de la température de
transition vitreuse et de l'enthalpie par analyse calorimétrique
différentielle*





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Published in Switzerland

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Foreword

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This document was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 2, *Testing and analysis*.

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Rubber, vulcanized — Determination of the glass transition temperature and enthalpy by differential scanning calorimetry

WARNING — Persons using this document should be familiar with normal laboratory practice, if applicable. This document does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices.

1 Scope

This document specifies a method of thermal analysis of vulcanized rubber by differential scanning calorimetry (DSC). This method is intended for the observation and measurement of various properties and phenomena associated, such as physical transitions (glass transition, melting and crystallization, polymorphic transitions, etc.).

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

ISO 23529, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11357-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

glass transition temperature

T_g

temperature of change from a glassy or hard condition to a rubbery or viscous condition

3.2

melting

transition stage between a fully crystalline or partially crystalline solid state and an amorphous liquid of variable viscosity

Note 1 to entry: The transition, also referred to as “fusion”, is characterized by an endothermic peak in the DSC curve (see [Figure 1](#)).

3.3
crystallization

transition stage between an amorphous liquid state and a fully crystalline or partially crystalline solid state

Note 1 to entry: The transition is characterized by an exothermic peak in the DSC curve (see [Figure 1](#)).

3.4
enthalpy of fusion

heat required to melt a material at constant pressure

Note 1 to entry: It is expressed in kilojoules per kilogram (kJ/kg) or joules per gram (J/g).

3.5
enthalpy of crystallization

heat released by the *crystallization* ([3.3](#)) of a material at constant pressure

Note 1 to entry: It is expressed in kilojoules per kilogram (kJ/kg) or joules per gram (J/g).

3.6
reference crucible

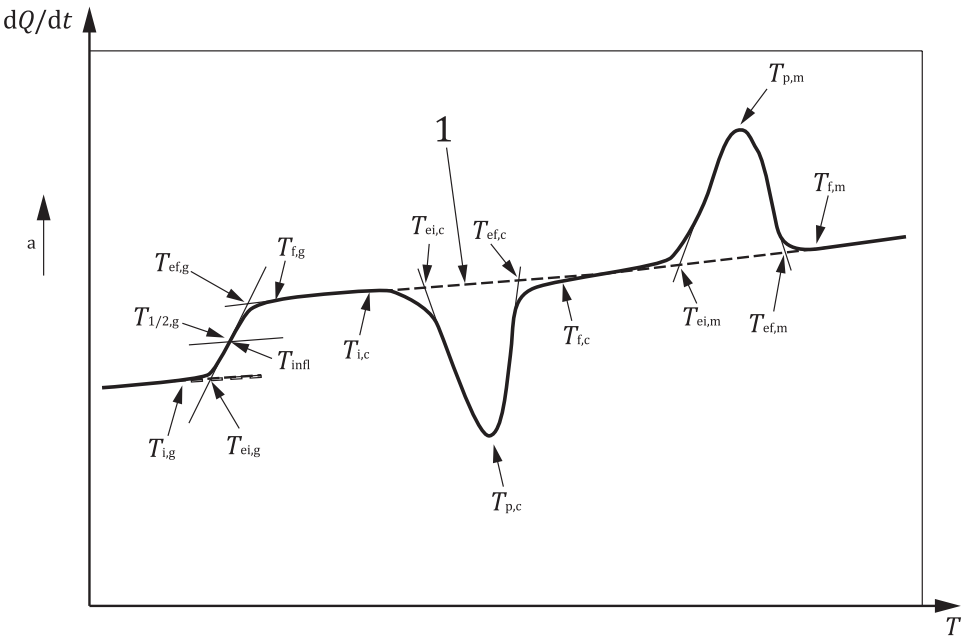
crucible used on the reference side of the symmetrical crucible holder assembly

Note 1 to entry: Normally, the reference crucible is empty.

Note 2 to entry: This reference material should be thermally inactive over the temperature and time range of interest.

4 Symbols

A typical DSC curve, with conventional temperatures, is shown in [Figure 1](#) and explained in [Table 1](#).



Key

dQ/dt	heat flow rate
T	temperature
T_i	onset temperature
T_{ei}	extrapolated onset temperature
$T_{1/2,g}$	midpoint temperature