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

GB/T 9870.3-2025

**Rubber, vulcanized or thermoplastic - Determination of dynamic
properties - Part 3: Glass transition temperature (T_g)**

硫化橡胶或热塑性橡胶 动态性能的测定 第3部分：玻璃化转变温度 (T_g)

(English Translation)

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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 9870, "Determination of dynamic properties of vulcanized or thermoplastic rubber". GB/T 9870 has been...

The following sections were published.

---Part 1: General Rules;

---Part 2: Low-frequency torsional oscillation method;

---Part 3: Glass transition temperature (T_g).

This document is equivalent to ISO 4664-3:2021 "Determination of dynamic properties of vulcanized or thermoplastic rubber-Part 3: Vitrification".

Transition temperature (T_g) the following minimal editorial changes have been made to this document.

---A warning message has been added.

Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents.

This document was proposed by the China Petroleum and Chemical Industry Federation.

This document is under the jurisdiction of the National Technical Committee on Standardization of Rubber and Rubber Products (SAC/TC35).

Introduction

Elastomers are inherently viscoelastic; therefore, their dynamic stress response is the sum of elastic and viscous responses. (Glass transition) the transition temperature (T_g) refers to the temperature at which an amorphous or semi-crystalline polymer transforms from a viscous rubber state to a brittle glass state; it is always lower than the melting point.

temperature.

This document is based on a forced vibration force response test, from which the stiffness of a material can be determined (see Appendix A), and the modulus can be calculated.

And $\tan\delta$ is the ratio of viscous modulus to elastic modulus. Plot the $\tan\delta$ -temperature relationship curve; the temperature corresponding to the peak of the curve is $\tan\delta$.

Glass transition temperature (T_g).

T_g measurements depend on test conditions and deformation patterns. Dynamic T_g measurements provide a more accurate representation of the material's temperature-dependent physical properties.

It is sensitive and related to understanding its operating temperature.

GB/T 9870, "Determination of Dynamic Properties of Vulcanized Rubber or Thermoplastic Rubber," aims to establish a system for determining the dynamic properties of vulcanized rubber or thermoplastic rubber using dynamic testing equipment.

The test method for the dynamic properties of thermoplastic rubber is proposed to consist of three parts.

---Part 1: General Rules. This section aims to provide a framework for the terminology and definitions, symbols, basic principles, equipment and calibration, and test conditions related to dynamic performance.

It describes common elements such as the sample, test procedure, and result presentation.

---Part 2: Low-Frequency Torsional Pendulum Method. The aim is to describe a method that utilizes a torsional pendulum device to achieve low-frequency torsional pendulum operation over a wide temperature range.

A method for determining the shear modulus and mechanical damping of vulcanized rubber or thermoplastic rubber under low strain conditions.

---Part 3: Glass Transition Temperature (T_g). The aim is to describe a method for determining hardness in the range of 30 IRHD to 80 IRHD.

Methods for determining the glass transition temperature of vulcanized rubber.

Determination of dynamic properties of vulcanized rubber or thermoplastic rubber Part 3: Glass Transition Temperature (T_g) Warning 1. Personnel using this document should be familiar with standard laboratory operating procedures. This document does not address all potential safety issues.

Users are responsible for taking appropriate safety and health measures and ensuring compliance with relevant national regulations.

Warning 2---Some steps in this section may involve substances used or generated, or waste produced, that could pose a hazard to the local environment.

After the experiment, safety procedures and disposal should be carried out in accordance with the relevant documents.

1 Scope

This document describes a method for determining the glass transition temperature (T_g) of vulcanized rubber with a hardness range of 30 IHD to 80 IHD.

Method. Dynamic performance was measured by applying a specified strain and frequency in a sinusoidal manner and performing temperature scans. The glass transition temperature (T_g) is the commonly used...

The glass transition temperature (T_g) is determined by the peak value of the tandelta-temperature curve. This method of determining the glass transition temperature can guide the use of materials.

temperature.

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are not included.

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

This document.

ISO 4664-1:2011 Determination of dynamic properties of vulcanized or thermoplastic rubber-Part 1: General rules (Rubber; vulcanized) Note. GB/T 9870.1-2006 Determination of dynamic properties of vulcanized rubber or thermoplastic rubber - Part 1: General rules (ISO 4664-1:2005, IDT) Note. GB/T 2941-2025 General procedures for specimen preparation and conditioning in physical testing of rubber (ISO 23529:2016, IDT)

3 Terms and Definitions

The terms and definitions defined in ISO 4664-1 apply to this document.

4 Principles

The specimen was subjected to temperature scanning using a dynamic mechanical analyzer at constant strain and frequency in a sealed test chamber. The maximum value of $\tan\delta$ corresponds to...

The temperature is the glass transition temperature (T_g).

5.1 General Rules

The testing equipment used should comply with the requirements of ISO 4664-1. Care should be taken to avoid resonance under operating conditions.