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

GB/T 33061.4-2023

**Plastics - Determination of dynamic mechanical properties -
Part 4: Non-resonance method under tensile vibration**

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3.1 Terms and definitions

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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 4 of GB/T 33061 "Determination of Dynamic Mechanical Properties of Plastics". GB/T 33061 has released the following

part.

---Part 1. General principles;

---Part 4. Non-resonant tensile vibration method;

---Part 5. Non-resonant bending vibration method;

---Part 6. Non-resonant shear vibration method;

---Part 7. Non-resonant torsional vibration method;

---Part 10. Determination of complex shear viscosity using a parallel plate oscillating rheometer;

---Part 11. Glass transition temperature.

This document is modified to adopt ISO 6721-4.2019 "Determination of dynamic mechanical properties of plastics Part 4. Tensile vibration non-common

Vibration Method".

Compared with ISO 6721-4.2019, this document has many structural adjustments.

Comparison list of structure number changes between two files

See Appendix A for the table.

Compared with ISO 6721-4:2019, this document has many technical differences. Vertical text is used in the outer margin of the clauses involved.

Single lines (|) are marked. A list of these technical differences and their causes is provided in Appendix B.

The following editorial changes have been made to this document.

---In order to coordinate with the existing standards, the name of the standard is changed to "Determination of dynamic mechanical properties of plastics - Part 4. Non-resonant tensile vibration"

"Movement Method";

---Replaced ISO 6721-1 with the informative reference GB/T 33061.1, and replaced ISO 6721-5 with GB/T 33061.5.

GB/T 33061.6 replaces ISO 6721-6 (see Chapter 1);

---Explanation of the symbol k_{00} . "The cross-sectional size of the steel specimen is the maximum size that the clamp can accommodate. The stiffness of the specimen is greater than that of the plastic specimen to be tested.

The material height is at least 100 times (see Note 2)" is changed to Note 1 (see 3.2);

--- Added a note "about using a torque wrench to maintain a fixed clamping force on the specimen and improve the reproducibility of the test" (see 9.3);

---Added Appendix A (informative) "List of comparison of structure numbers between this document and ISO 6721-4:2019";

---Added Appendix B (informative) "List of technical differences between this document and ISO 6721-4:2019 and their reasons".

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

Dynamic mechanical analysis (DMA) measures the response of a material under alternating stress or strain under programmed temperature control. The measurement results reflect the material's response to alternating stress or strain.

The viscoelasticity of the material.

This document uses the DMA method to determine the storage modulus, loss modulus and loss factor of plastics as a function of temperature in non-resonant stretching mode.

change. According to the above results, the glass transition, secondary relaxation, crystallization, cross-linking, phase separation, etc. of the plastic can be characterized. The above physical quantities determine the plastic

Important parameters for using features.

GB/T 33061 specifies various methods for determining the dynamic mechanical properties of rigid plastics within the range of linear viscoelastic behavior. It is planned to consist of twelve

Partial composition.

---Part 1.General principles. The purpose is to establish common definitions and various aspects of test methods for the determination of dynamic mechanical properties.

---Part 2.Twist method. The purpose is to establish an operable, traceable and verifiable method for the measurement of energy storage and loss components of torsional modulus.

Real program.

---Part 3.Resonant bending vibration curve method. The aim is to obtain the bending composite modulus E_f^* of the homogeneous plastic and the layer used for sound insulation

Determine the damping characteristics of compressed plastics and establish operable, traceable and verifiable procedures.

---Part 4.Non-resonant tensile vibration method. The purpose is to determine the forced non-resonance method of the tensile complex modulus E^* of plastics.

Establish operable, traceable and verifiable procedures.

---Part 5.Non-resonant bending vibration method. The purpose is to determine the forced non-resonance method of the plastic bending complex modulus E_f^* .

Establish operable, traceable and verifiable procedures.

---Part 6.Non-resonant shear vibration method. The purpose is to determine the forced non-resonant method of plastic shear complex modulus G^* ,

Establish operable, traceable and verifiable procedures.

---Part 7.Non-resonant torsional vibration method. The purpose is to calculate the torsion of the shear complex modulus G^* of a strip or rod-shaped solid polymer.

Convert the measurement to non-resonant methods and establish operable, traceable and verifiable procedures.

---Part 8.Wave conduction longitudinal shear vibration method. The purpose is to calculate the longitudinal complex modulus L^* and shear complex modulus of the polymer

For the determination of the energy storage component of G^* , establish an operable,

traceable and verifiable procedure.

---Part 9.Sonic pulse propagation tensile vibration method. The purpose is to measure the storage component of polymer composite tensile modulus E^* .

Determine and establish operable, traceable and verifiable procedures.

---Part 10.Determination of complex shear viscosity using a parallel plate oscillating rheometer. The purpose is to provide dynamic rheological properties of polymer melts.

Determination of test methods and establishment of operable, traceable and verifiable procedures.

---Part 11.Glass transition temperature. The purpose is to determine the glass transition temperature (T_g) for dynamic mechanical properties.

Establish operable, traceable and verifiable procedures.

---Part 12.Non-resonant compression vibration method. The purpose is to establish an operable and practical method for the determination of the compression composite modulus E^* of polymers.

Traceable and verifiable procedures.

Determination of dynamic mechanical properties of plastics

Part 4.Non-resonant tensile vibration method

1 Scope

This document describes a forced non-resonant method for determining the tensile complex modulus E^* of plastics in the frequency range 0.001Hz~100Hz.

Note. Higher frequencies may lead to larger errors in the measured dynamic performance (see 9.5.1 and 10.1.2).

This document is suitable for the determination of dynamic storage modulus between 0.01GPa and 5GPa, and can also be used to study plastics beyond this modulus range.

However, its dynamic mechanical properties can be measured more accurately using other non-tensile deformation modes [i.e. shear mode with $G' < 0.01\text{GPa}$ (see

GB/T 33061.6), bending mode with $E' > 5\text{GPa}$ (see ISO 6721-3 or GB/T 33061.5)].

This document is particularly suitable for the determination of loss factors greater than 0.02, in order to facilitate the study of the dynamics of most glassy-rubbery relaxation zones.

Can change with temperature and frequency (see GB/T 33061.1).

2 Normative reference documents