ICS 83.080.01
CCS G 31

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 33061.7-2023

Plastics - Determination of dynamic mechanical properties - Part 7: Non-resonance method under torsional vibration

Issued on: August 6, 2023 **Implemented on: March 1, 2024**

Issued by: State Administration for Market Regulation, China National Standardization Administration

Table of Contents

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 7 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 6721-7.2019 "Determination of dynamic mechanical properties of plastics Part 7.Torsional vibration non-resonant 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 existing standards, the name of the standard is changed to "Determination of dynamic mechanical properties of plastics - Part 7.Non-resonant torsional vibration"

"Movement Method";

---Replaced ISO 6721-1 with the informative reference GB/T 33061.1, and GB/T 33061.6 replaced ISO 6721-6 (see

Chapter 1);

--- Change the explanation of the symbol Gammainfinity "The cross-sectional size and length of the steel specimen can make its stiffness at least 100 times higher than that of the plastic to be tested"

Note 1 (see 3.2);

---As the structure of each sample may be different, samples of different thicknesses are prepared through injection molding, and microscopic changes in dynamic performance can be observed.

Small differences. " is changed to Note (see 6.2);

--- 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);

---Replace "If it is found that the clamping force has a significant impact on the measured value, the clamping surface of the sample may be too small. Choose a larger clamping surface or a wider

The sample is helpful to reduce this effect. " is changed to Note (see 9.3);

---Added Appendix A (informative) "List of comparison of structure numbers between this document and ISO 6721-7.2019";

---Added Appendix B (informative) "List of technical differences between this document and ISO 6721-7.2019 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 shear modulus of plastics in non-resonant torsional vibration modes, including storage modulus and loss mode.

quantity, and the change of loss factor with temperature. Based on these data, the relaxation behavior and transformation of plastics at all levels can be characterized, and information related to the use of plastics can be obtained.

Important parameters related to the properties of use.

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 the following departments

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 Ef* 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 Ef*.

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 (Tg) 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 7.Non-resonant torsional vibration method

1 Scope

This document describes the method for determining the shear complex modulus G* of rectangular or cylindrical solid plastics in the frequency range 0.001Hz~100Hz.

Torsional non-resonant method. Higher frequencies may lead to larger errors in the measured dynamic performance (see 10.1.1 and 9.5.1).

This document is suitable for the determination of dynamic storage modulus between 10MPa (hard rubber) and 10GPa (fiber-reinforced plastic). It can also be used to study