Designation: D 5418 – 01

Standard Test Method for Plastics: Dynamic Mechanical Properties: In Flexure (Dual Cantilever Beam)[1]

This standard is issued under the fixed designation D 5418; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope *

1.1 This test method covers the use of dynamic mechanical instrumentation for gathering and reporting the viscoelastic properties of thermoplastic and thermosetting resins and composite systems in the form of rectangular bars molded directly or cut from sheets, plates, or molded shapes. The elastic modulus data generated may be used to identify the thermomechanical properties of a plastics material or composition.

1.2 This test method is intended to provide means for determining the modulus as a function of temperature of plastics using nonresonant forced-vibration techniques, as outlined in Practice D 4065. Plots of the elastic (storage), loss (viscous) and complex moduli, and tan delta as a function of frequency, time, or temperature are indicative of significant transitions in the thermomechanical performance of the polymeric material system.

1.3 This test method is valid for a wide range of frequencies, typically from 0.01 to 100 Hz.

1.4 Apparent discrepancies may arise in results obtained under differing experimental conditions. These apparent differences from results observed in another study can usually be reconciled, without changing the observed data, by reporting in full (as described in this test method) the conditions under which the data were obtained.

1.5 Test data obtained by this test method are relevant and appropriate for use in engineering design.

1.6 The values stated in SI units are to be regarded as standard.

1.7 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—There is no similar or equivalent ISO standard.

2. Referenced Documents

2.1 *ASTM Standards:*

D 4065 Practice for Determining and Reporting Dynamic Mechanical Properties of Plastics[2]

D 4092 Terminology Relating to Dynamic Mechanical Measurements on Plastics[2]

D 5279 Test Method for Measuring the Dynamic Mechanical Properties of Plastics in Torsion[3]

3. Terminology

3.1 For definitions applicable to this practice see Terminology D 4092.

4. Summary of Test Method

4.1 This test method covers the determination of the elastic modulus of plastics using dynamic mechanical techniques. A bar of rectangular cross section is tested as a beam in dynamic linear displacement or bending. The dual-cantilever beam specimen is gripped between two clamps. The specimen of known geometry is placed in mechanical linear displacement, with the displacement strain or deformation applied at the center of the dual-cantilever beam. The forced-strain displacement is at either a fixed frequency, or variable frequencies at either isothermal condition, or with a linear temperature increase. The elastic or loss modulus, or both, of the polymeric material system are measured in flexure.[4]

5. Significance and Use

5.1 This test method provides a simple means of characterizing the thermomechanical behavior of plastics materials using a very small amount of material. Since small test specimen geometries are used, it is essential that the specimens be representative of the material being tested. The data obtained may be used for quality control, research and development, and establishment of optimum processing conditions.

5.2 Dynamic mechanical testing provides a sensitive method for determining thermomechanical characteristics by measuring the elastic and loss moduli as a function of frequency, temperature, or time. Plots of moduli and tan delta

[1] This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.10 on Mechanical Properties.

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[2] *Annual Book of ASTM Standards*, Vol 08.02.

[3] *Annual Book of ASTM Standards*, Vol 08.03.

[4] The particular method for measurement of the elastic and loss moduli and tan delta depends upon the individual instrument's operating principles.

*A Summary of Changes section appears at the end of this standard.