Designation: E2425 – 05

Standard Test Method for Loss Modulus Conformance of Dynamic Mechanical Analyzers[1]

This standard is issued under the fixed designation E2425; 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 describes the performance confirmation or measurement of conformance for the loss modulus scale of a commercial or custom-built dynamic mechanical analyzer (DMA) at 21 °C using poly(methylmethacrylate) as a reference material.

1.2 SI units are the standard

1.3 There is no ISO standard equivalent to this test method.

1.4 *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 to determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E473 Terminology Relating to Thermal Analysis and Rheology

E1142 Terminology Relating to Thermophysical Properties

E1867 Test Method for Temperature Calibration of Dynamic Mechanical Analyzers

3. Terminology

3.1 *Definitions:* Specific technical terms used in this test method are defined in Terminologies E473 and E1142.

4. Summary of Test Method

4.1 The loss modulus signal measured by a dynamic mechanical analyzer for an elastic material is compared to the reported loss modulus for that reference material. A linear relationship is used to correlate the experimental loss modulus signal with the reported value of the reference material.

4.2 The mode of deformation (for example, tensile, flexure, compression, shear. etc.) shall be reported.

5. Significance and Use

5.1 This test method demonstrates conformity of a dynamic mechanical analyzer at an isothermal temperature of 21 °C.

5.2 Dynamic mechanical analysis experiments often use linear temperature change. This method does not address the effect of that change in temperature on the loss modulus.

5.3 This method may be used in research and development, specification acceptance, and quality control or assurance.

6. Apparatus

6.1 The essential instrumentation required to provide the minimum dynamic mechanical capability for this test method includes:

6.1.1 *Drive Actuator*, to apply force (or displacement) to the specimen in a periodic manner. This actuator may also be capable of providing static force or displacement to the specimen.

6.1.2 *Coupling Shaft*, or other means to transmit the force from the motor to the specimen.

6.1.3 *Clamping System(s)*, to fix the specimen between the drive shaft and the stationary clamp(s).

6.1.4 *Position Sensor*, to measure the change in position of the specimen during dynamic motion, or

6.1.5 *Force Sensor*, to measure the force developed by the specimen.

6.1.6 *Temperature Sensor*, to provide an indication of the specimen temperature to within ± 1 °C.

6.1.7 *Furnace*, to provide controlled heating or cooling of a specimen at a constant temperature or at a constant rate within the applicable temperature range of -100 to +300 °C.

6.1.8 *Temperature Controller*, capable of executing a specific temperature program by operating the furnace between -100 and +300 °C and at a constant temperature within that range.

6.1.9 *Recording Device*, capable of recording and displaying the loss modulus signal as a change in specimen stress (force) or position (displacement) on the Y-axis and temperature or time on the X-axis.

[1] This test method is under the jurisdiction of ASTM Committee E37 on Thermal Measurements and is the direct responsibility of Subcommittee E37.10 Fundamental, Statistical and Mechanical Properties.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.