



Designation: D 4440 – 95a01

An American National Standard

Standard Practice Test Method for Rheological Measurement of Polymer Melts Using Plastics: Dynamic Mechanical Procedures Properties Melt Rheology¹

This standard is issued under the fixed designation D 4440; 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 ~~practice test method~~ covers the use of dynamic mechanical instrumentation for use in gathering and reporting the rheological properties of thermoplastic resins. It may be used as a ~~practice test method~~ for determining the complex viscosity and significant viscoelastic characteristics of such materials as a function of frequency, strain amplitude, temperature, and time. Such properties may be influenced by fillers and other additives.

1.2 It incorporates a laboratory ~~practice test method~~ for determining the relevant rheological properties of a polymer melt subjected to various oscillatory deformations on an instrument of the type commonly referred to as mechanical or dynamic spectrometer.

1.3 This ~~practice test method~~ is intended to provide means of determining the rheological properties of molten polymers, such as thermoplastics and thermoplastic elastomers over a range of temperatures by nonresonant forced-vibration techniques. Plots of modulus, viscosity, and tan delta as a function of dynamic oscillation (frequency), strain amplitude, temperature, and time are indicative of the viscoelastic properties of a molten polymer.

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

1.5 This ~~practice test method~~ is intended for homogenous and heterogenous molten polymeric systems and composite formulations containing chemical additives, including fillers, reinforcements, stabilizers, plasticizers, flame retardants, impact modifiers, processing aids, and other important chemical additives often incorporated into a polymeric system for specific functional properties, and which could affect the processability and functional performance. These polymeric material systems have molten viscosities less than 10^6 Pa·s (10^7 poise).

1.6 Apparent discrepancies may arise in results obtained under differing experimental conditions. Without changing the observed data, reporting in full (as described in this ~~practice test method~~) the conditions under which the data were obtained will enable apparent differences observed in another study to be reconciled.

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

1.8 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.9 *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—This test method is technically equivalent to ISO 6721, Part 10.

2. Referenced Documents

2.1 ASTM Standards:

¹ This ~~practice test method~~ is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.10 on Mechanical Properties.

Current edition approved Oct. 10, 1995; 2001. Published December 1995; November 2001. Originally published as D 4440 – 84. Last previous edition D 4440 – 95a.

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