This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: D7605 – 11 (Reapproved 2022)

Standard Test Method for Thermoplastic Elastomers—Measurement of Polymer Melt Rheological Properties and Congealed Dynamic Properties Using Rotorless Shear Rheometers[1]

This standard is issued under the fixed designation D7605; 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 a rotorless oscillating shear rheometer for the measurement of the flow properties of polymer melts and their respective congealed dynamic properties for thermoplastic elastomers (TPE) which includes thermoplastic vulcanizates (TPV). These flow properties and congealed dynamic properties are related to factory processing and product performance.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1349 Practice for Rubber—Standard Conditions for Testing

D3896 Practice for Rubber From Synthetic Sources—Sampling

D4483 Practice for Evaluating Precision for Test Method Standards in the Rubber and Carbon Black Manufacturing Industries

D6600 Practice for Evaluating Test Sensitivity for Rubber Test Methods

3. Terminology

3.1 *Definitions:*

3.1.1 *complex shear modulus, G*, n*—ratio of peak amplitude shear stress to peak amplitude shear strain; mathematically, $G^* = [(S^*/\text{Area})/\text{Strain}] = (G'^2 + G''^2)^{1/2}$.

3.1.2 *complex torque, S*, n*—peak amplitude torque response measured by a reaction torque transducer for a sinusoidally applied strain; mathematically, S* is computed by $S^* = (S'^2 + S''^2)^{1/2}$.

3.1.3 *congealed thermoplastic, n*—thermoplastic polymer that when cooled from the melt state exhibits a substantial portion of the physical properties of the solid state.

3.1.4 *dynamic complex viscosity, η*, n*—ratio of the complex shear modulus, G* to the oscillation frequency, ω, in radians per second.

3.1.5 *elastic torque, S', n*—peak amplitude torque component which is in phase with a sinusoidally applied strain.

3.1.6 *loss angle, δ, n*—phase angle by which the complex torque (S*) leads a sinusoidally applied strain.

3.1.7 *loss factor, tan δ, n*—ratio of loss modulus to storage modulus, or the ratio of viscous torque to elastic torque; mathematically, $\tan \delta = G''/G' = S''/S'$.

3.1.8 *loss shear modulus, G", n*—ratio of (viscous) peak amplitude shear stress to peak amplitude shear strain for the torque component 90° out of phase with a sinusoidally applied strain; mathematically, G" = [(S"/Area) /Peak Strain].

3.1.9 *real dynamic viscosity, η', n*—ratio of the loss shear modulus, G" to the oscillation frequency, ω, in radians per second.

3.1.10 *storage shear modulus, G', n*—ratio of (elastic) peak amplitude shear stress to peak amplitude shear strain for the torque component in phase with a sinusoidally applied strain; mathematically, G' = [(S'/Area) /Peak Strain].

[1] This test method is under the jurisdiction of ASTM Committee D11 on Rubber and Rubber-like Materials and is the direct responsibility of Subcommittee D11.12 on Processability Tests.

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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.

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