



Standard Practice for Glass Transition Temperatures of Hydrocarbon Resins by Differential Scanning Calorimetry¹

This standard is issued under the fixed designation D6604; 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 covers determination of glass transition temperatures of hydrocarbon (HC) resins by differential scanning calorimetry (DSC).

1.2 This practice is applicable to HC resins as defined in Terminology [D6640](#). The normal operating temperature range is from the cryogenic region to approximately 180°C. The temperature range can be extended.

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

1.4 Further discussion of glass transition can be found in Test Method [D3418](#), and Test Method [E1356](#).

1.5 *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.*

2. Referenced Documents

2.1 ASTM Standards:²

[D3418](#) Test Method for Transition Temperatures and Enthalpies of Fusion and Crystallization of Polymers by Differential Scanning Calorimetry

[D6640](#) Practice for Collection and Handling of Soils Obtained in Core Barrel Samplers for Environmental Investigations

[E473](#) Terminology Relating to Thermal Analysis and Rheology

[E1356](#) Test Method for Assignment of the Glass Transition Temperatures by Differential Scanning Calorimetry

¹ This practice is under the jurisdiction of ASTM Committee [D01](#) on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee [D01.34](#) on Pine Chemicals and Hydrocarbon Resins.

Current edition approved June 1, 2013. Published June 2013. Originally approved in 2000. Last previous edition approved in 2009 as D6604 – 00 (2009) ^{ϵ 1}. DOI: 10.1520/D6604-00R13.

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.

3. Terminology

3.1 Definitions:

3.1.1 *differential scanning calorimetry (DSC), n*—A technique in which the difference in energy inputs into a substance and a reference material is measured as a function of temperature, while the substance and reference material are subjected to a controlled temperature program.

3.1.1.1 *Discussion*—The record is the DSC curve. Two modes, power-compensation DSC and heat-flux DSC, can be distinguished, depending on the method of measurement used.

3.2 For other definitions of terms relating to thermal analysis, see Terminology [E473](#).

4. Summary of Practice

4.1 This practice consists of heating or cooling the test material at a controlled rate, in a controlled atmosphere, and continuously monitoring with a suitable sensing device, the difference in heat input between a reference material and a test material due to energy changes in the material. Absorption or release of energy marks a transition in the specimen resulting in a corresponding baseline shift in the heating or cooling curve.

5. Significance and Use

5.1 Thermal analysis provides a rapid method for determining transition temperatures in HC resins that possess them.

5.2 This practice is useful for both quality assurance and research.

6. Apparatus

6.1 *Differential Scanning Calorimeter*—An instrument capable of heating or cooling at rates up to $20 \pm 1^\circ\text{C}/\text{minute}$ and automatically recording the difference in input between the sample and a reference material to the required sensitivity and precision.

6.2 *Sample Tubes or Pans*—Borosilicate glass tubes are used for certain applications and aluminum or other metal pans of high thermal conductivity for other applications.

6.3 *Reference Material*—Glass beads, indium, alumina, silicon carbide, or mercury in a hermetically sealed sample pan, or a material known to be unaffected by repeated heating and