



Designation: E 794 – 98

Standard Test Method for Melting And Crystallization Temperatures By Thermal Analysis¹

This standard is issued under the fixed designation E 794; 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 determination of melting (and crystallization) temperatures of pure materials by differential scanning calorimetry (DSC) and differential thermal analysis (DTA).

1.2 This test method is generally applicable to thermally stable materials with well-defined melting temperatures.

1.3 The normal operating range is from –120 to 600°C for DSC and 25 to 1500°C for DTA. The temperature range can be extended depending upon the instrumentation used.

1.4 Computer or electronic based instruments, techniques, or data treatment equivalent to those in this test method may be used.

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

1.6 *This standard does not purport to address all of the safety problems, 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:

E 473 Terminology Relating to Thermal Analysis²

E 793 Test Method for Heats of Fusion and Crystallization by Differential Scanning Calorimetry²

E 967 Practice for Temperature Calibration of Differential Scanning Calorimeters and Differential Thermal Analyzers²

E 1142 Terminology Relating to Thermophysical Properties²

3. Terminology

3.1 Definitions—Specialized terms used in this test method are defined in Terminologies E 473 and E 1142.

¹ This test method is under the jurisdiction of ASTM Committee E-37 on Thermal Measurements and is the direct responsibility of Subcommittee E37.01 on Test Methods and Recommended Practices.

Current edition approved March 10, 1998. Published December 1998. Originally published as E 794 – 81. Last previous edition E 794 – 95.

² Annual Book of ASTM Standards, Vol 14.02.

4. Summary of Test Method

4.1 The test method involves heating (or cooling) a test specimen at a controlled rate in a controlled environment through the region of fusion (or crystallization). The difference in heat flow (for DSC) or temperature (for DTA) between the test material and a reference material due to energy changes is continuously monitored and recorded. A transition is marked by absorption (or release) of energy by the specimen resulting in a corresponding endothermic (or exothermic) peak in the heating (or cooling) curve.

NOTE 1—Enthalpies of fusion and crystallization are sometimes determined in conjunction with melting or crystallization temperature measurements. These enthalpy values may be obtained by Test Method E 793.

5. Significance and Use

5.1 Differential scanning calorimetry and differential thermal analysis provide a rapid method for determining the fusion and crystallization temperatures of crystalline materials.

5.2 This test is useful for quality control, specification acceptance, and research.

6. Interferences

6.1 Test specimens need to be homogeneous, since milligram quantities are used.

6.2 Toxic or corrosive effluents, or both, may be released when heating the material and could be harmful to personnel and to apparatus.

7. Apparatus

7.1 Apparatus shall be of either type listed below:

7.1.1 *Differential Scanning Calorimeter*, capable of heating (or cooling) at rates up to at least 10°C/min and of automatically recording the differential energy input between a specimen and a reference material both to the required sensitivity and precision.

7.1.2 *Differential Thermal Analyzer*, capable of heating (or cooling) at rates up to at least 10°C/min and of automatically recording the differential temperature between a specimen and a reference material both to the required sensitivity and precision.

7.2 *Specimen Capsules or Pans*, for DSC, composed of aluminum or other inert material of high thermal conductivity. For DTA, sample cups or tubes composed of borosilicate glass,