



Designation: E 537 – 02

# Standard Test Method for The Thermal Stability Of Chemicals By Differential Scanning Calorimetry<sup>1</sup>

This standard is issued under the fixed designation E 537; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

## INTRODUCTION

Committee E-27 is currently engaged in developing methods to determine the hazard potential of chemicals. An estimate of this potential may usually be obtained by the use of program CHETAH 7.0 to compute the maximum energy of reaction of the chemical or mixture of chemicals.<sup>2</sup>

The expression “hazard potential” as used by this committee is defined as the degree of susceptibility of material to ignition or release of energy under varying environmental conditions.

The primary purpose of this test method is to detect enthalpic changes and to approximate the temperature of initiation and enthalpies (heats) of these events. Differential scanning calorimetry offers the advantage of using very small specimens on the order of a few milligrams.

## 1. Scope

1.1 This test method covers the ascertainment of the presence of enthalpic changes in a test specimen, using minimum quantities of material, approximates the temperature at which these enthalpic changes occur and determines their enthalpies (heats) using differential scanning calorimetry or pressure differential scanning calorimetry.

1.2 This test method may be performed on solids, liquids, or slurries.

1.3 This test method may be performed in an inert or a reactive atmosphere with an absolute pressure range from 100 Pa through 7 MPa and over a temperature range from 300 to 800 K (27 to 527°C).

1.4 SI values are the standard.

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

1.6 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns 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. Specific safety precautions are given in Section 8.*

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee E27 on Hazard Potential of Chemicals and is the direct responsibility of Subcommittee E27.02 on Thermal Stability and Condensed Phases.

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<sup>2</sup> A complete assessment of the hazard potential of chemicals must take into account a number of realistic factors not considered in this test method or the CHETAH program.

## 2. Referenced Documents

2.1 *ASTM Standards:*

E 473 Terminology Relating to Thermal Analysis<sup>3</sup>

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method<sup>3</sup>

E 967 Practice for Temperature Calibration of Differential Scanning Calorimeters and Differential Thermal Analyzers<sup>3</sup>

E 968 Practice for Heat Flow Calibration of Differential Scanning Calorimeters<sup>3</sup>

E 1445 Terminology Relating to Hazardous Potential of Chemicals<sup>3</sup>

E 1860 Test Method for Elapsed Time Calibration of Thermal Analyzers<sup>3</sup>

## 3. Terminology

3.1 *Definitions:*

3.1.1 Specific technical terms used in this standard are defined in Terminologies E 473 and E 1445.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *DSC curve*—a record of a differential scanning calorimeter where the change in heat flow ( $\Delta q$ ) is plotted on the ordinate and temperature or time is plotted on the abscissa (see Figs. 1 and 2 and Terminology E 473).

3.2.2 *peak*—that portion of a thermal curve that is attributable to the occurrence of a single process. It is normally characterized by a deviation from the established baseline, a

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 14.02.

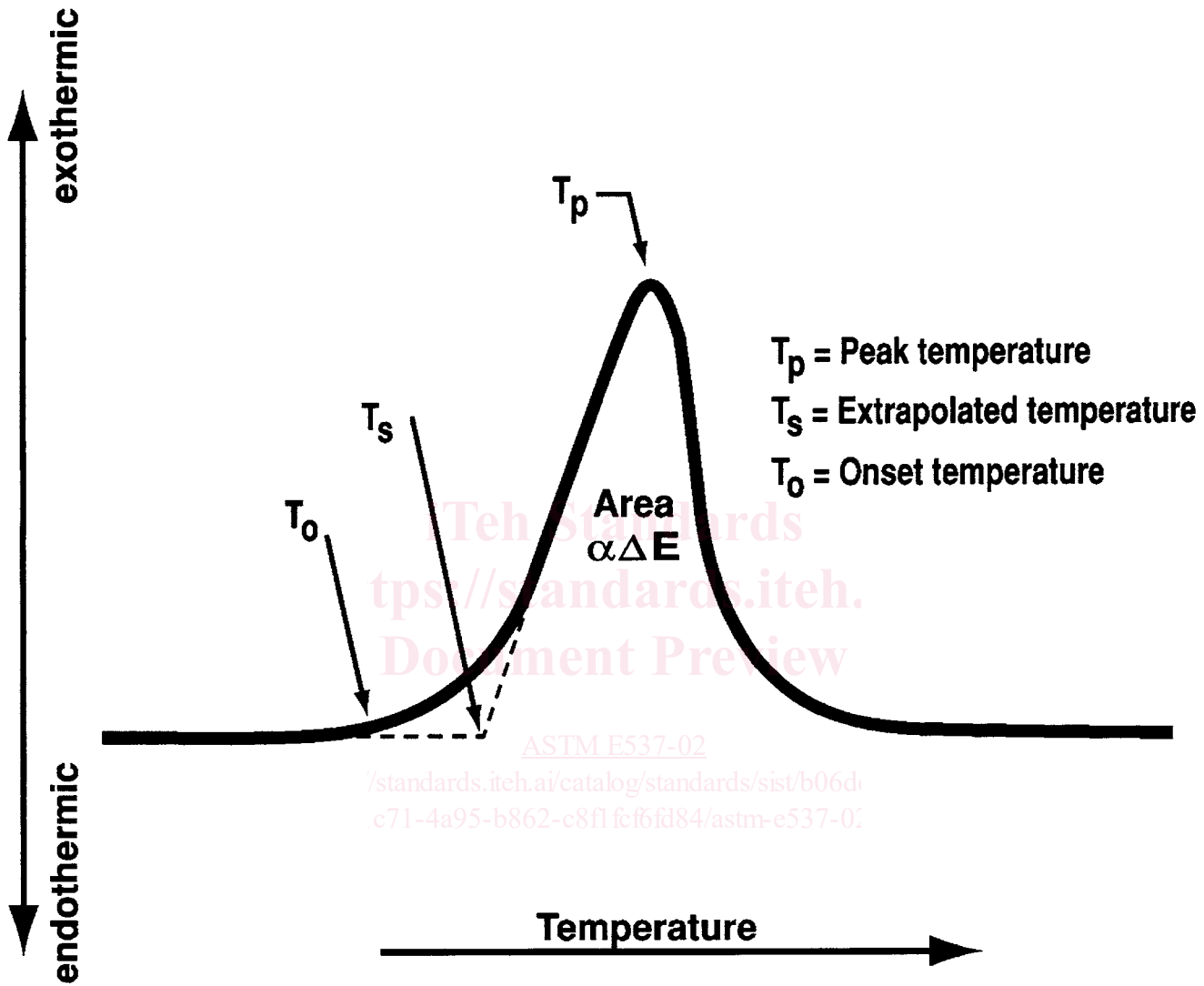


FIG. 1 Typical DSC Curve with Exotherm

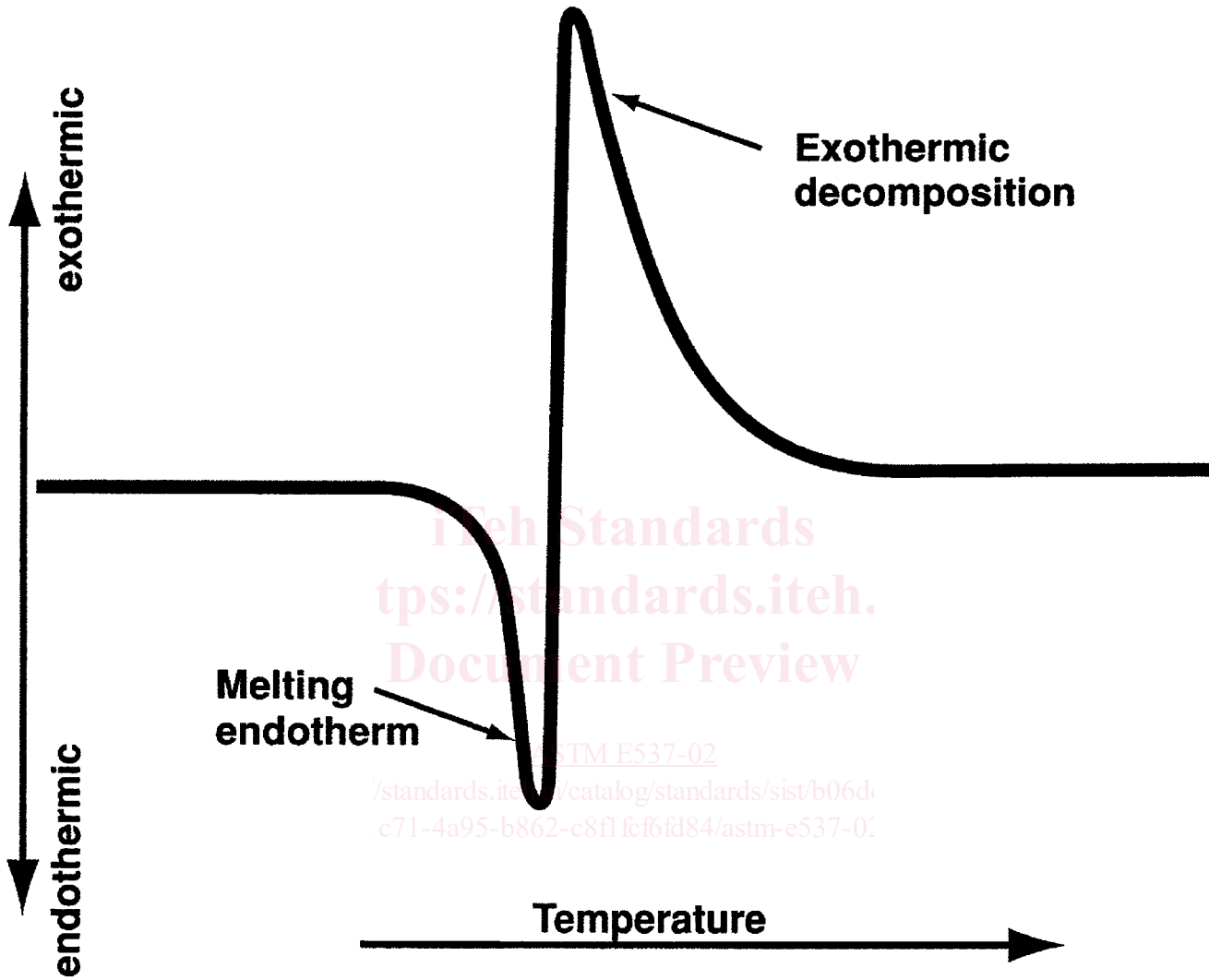


FIG. 2 DSC Curve Illustrating a Melting Process Immediately Followed by an Exothermic Decomposition

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