



Standard Test Method for Kinetic Parameters for Thermally Unstable Materials by Differential Scanning Calorimetry Using the Kissinger Method¹

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ε¹ NOTE—Research report information was editorially added to 14.1 in September 2015.

1. Scope

1.1 This test method describes the determination of the kinetic parameters of Arrhenius activation energy and pre-exponential factor using the Kissinger variable heating rate iso-conversion method (**1**, **2**)² and activation energy and reaction order by the Farjas method (**3**) for thermally unstable materials. The test method is applicable to the temperature range from 300 to 900 K (27 to 627°C).

1.2 Both *n*th order and accelerating reactions are addressed by this method over the range of $0.5 < n < 4$ and $1 < p < 4$ where *n* is the *n*th order reaction order and *p* is the Avrami reaction order (**4**). Reaction orders *n* and *p* are determined by the Farjas method (**3**).

1.3 This test method uses the same experimental conditions as Test Method E698. The Flynn/Wall/Ozawa data treatment of Test Method E698 may be simultaneously applied to these experimental results.

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

1.5 There is no ISO equivalent to this standard.

1.6 *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 appro-*

priate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards:³

E473 Terminology Relating to Thermal Analysis and Rheology

E537 Test Method for The Thermal Stability of Chemicals by Differential Scanning Calorimetry

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

E698 Test Method for Arrhenius Kinetic Constants for Thermally Unstable Materials Using Differential Scanning Calorimetry and the Flynn/Wall/Ozawa Method

E967 Test Method for Temperature Calibration of Differential Scanning Calorimeters and Differential Thermal Analyzers

E968 Practice for Heat Flow Calibration of Differential Scanning Calorimeters

E1142 Terminology Relating to Thermophysical Properties

E1231 Practice for Calculation of Hazard Potential Figures-of-Merit for Thermally Unstable Materials

E1860 Test Method for Elapsed Time Calibration of Thermal Analyzers

E1970 Practice for Statistical Treatment of Thermoanalytical Data

E2041 Test Method for Estimating Kinetic Parameters by Differential Scanning Calorimeter Using the Borchardt and Daniels Method

¹ This test method is under the jurisdiction of ASTM Committee E37 on Thermal Measurements and is the direct responsibility of Subcommittee E37.01 on Calorimetry and Mass Loss.

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² The boldface numbers in parentheses refer to the list of references at the end of this standard.

³ 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.