



Standard Test Method for Determining Vapor Pressure by Thermal Analysis¹

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1. Scope

1.1 This test method describes a procedure for the determination of the vapor pressure of pure liquids or melts from boiling point measurements made using differential thermal analysis (DTA) or differential scanning calorimetry (DSC) instrumentation operated at different applied pressures.

1.2 This test method may be used for the temperature range 273 to 773 K (0 to 500°C) and for pressures between 0.2 kPa to 2 MPa. These ranges may differ depending upon the instrumentation used and the thermal stability of materials tested. Because a range of applied pressures is required by this test method, the analyst is best served by use of instrumentation referred to as high pressure differential thermal instrumentation (HPDSC or HPDTA).

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard. (See also [IEEE/ASTM SI 10](#).)

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

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

[E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods](#)

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

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

[E967 Test Method for Temperature Calibration of Differential Scanning Calorimeters and Differential Thermal Analyzers](#)

[E1142 Terminology Relating to Thermophysical Properties](#)

[E2071 Practice for Calculating Heat of Vaporization or Sublimation from Vapor Pressure Data](#)

[IEEE/ASTM SI 10 Standard for Use of the International System of Units \(SI\) The Modern Metric System](#)

3. Terminology

3.1 Definitions:

3.1.1 The following terms are applicable to this test method and can be found in either Terminology [E473](#) or Terminology [E1142](#): *boiling pressure, boiling temperature, differential scanning calorimetry (DSC), differential thermal analysis (DTA), vapor pressure, vaporization point, vaporization temperature.*

3.2 Symbols:

3.2.1 A, B, C—Antoine vapor pressure equation (**1**)³ constants ($\log_{10}$, kPa, K):

$$\text{Antoine vapor pressure equation: } \log_{10} P = A - B/(T + C)$$

where:

P = vapor pressure, kPa, and

T = temperature, K.

4. Summary of Test Method

4.1 A specimen in an appropriate container is heated at a constant rate within a DTA or DSC instrument operated under an applied constant vacuum/pressure between 0.2 kPa and 2 MPa until a boiling endotherm is recorded. Boiling is observed at the temperature where the specimen partial pressure equals the pressure applied to the test chamber. The pressure is recorded during observation of the boiling endotherm and the boiling temperature is recorded as the extrapolated onset temperature. This measurement is repeated using new specimens for each of five or more different pressures covering the pressure range of interest. The pressure-temperature data are fitted as $\log_{10} P$ and $1/T$ (K^{-1}) to the Antoine vapor pressure equation (see [Fig. 1](#)). Vapor pressure values required for specific reports are then computed from the derived equation.

³ The boldface numbers in parentheses refer to a list of references at the end of this standard.