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# Standard Terminology Relating to Thermal Analysis and Rheology [1]

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## 1. Scope

1.1 This terminology is a compilation of definitions of terms used in ASTM documents relating to thermal analysis and rheology. This terminology includes only those terms for which ASTM either has standards or is contemplating some action. It is not intended to be an all-inclusive listing of terms related to thermal analysis and rheology.

1.2 This terminology specifically supports the single-word form for terms using thermo as a prefix, such as thermoanalytical or thermomagnetometry, while recognizing that for some terms a two-word form can be used, such as thermal analysis. This terminology does not support, nor does it recommend, use of the grammatically incorrect, single-word form using thermal as a prefix, such as, thermalanalytical or thermalmagnetometry.

1.3 A definition is a single sentence with additional information included in notes. It is reviewed every five years.

## 2. Terminology

**adiabatic,** *adj*— no heat exchange with the surroundings.

**calorimeter,** *n*—apparatus for measuring quantities of absorbed or evolved heat.

**combined,** *adj*—the application of two or more techniques to different samples at the same time.

**controlled-rate thermal analysis** (*CRTA*)**,** *n*—a family of techniques that monitors the temperature versus time profile needed to maintain a chosen, fixed rate of change of a property of a substance.

NOTE 1—Compared to controlled-temperature experiments, where the reaction rate tends to increase exponentially and the rate can become limited by heat or mass transfer, CRTA experiments are more likely to involve the chemical reaction as the limiting step. This technique can also improve the resolution of multiple reactions. For example, in controlled rate experiments, power to the furnace is controlled to ensure a fixed rate of mass loss (or gain).

**controlled-temperature program,** *n*—the temperature history experienced by a sample during the course of a thermal analysis experiment.

NOTE 2—In contrast to controlled-rate experiments, power to the furnace is controlled to ensure a fixed rate of temperature change for controlled-temperature experiments. The program may include heating or cooling segments in which the temperature is changed at a fixed rate, isothermal segments in which time becomes the explicit independent variable, or any sequence of these individual segments. If the atmosphere (or vacuum) around the sample is changed by some external action (depending on the independent variable only—temperature or time) during the course of the experiment, that too becomes part of the controlled-temperature program.

**curve, thermal,** *n*—the plot of a dependent parameter against an independent parameter such as temperature or time.

**dielectric thermal analysis** (*DETA or DEA*)**,** *n*—a technique in which the dielectric constant (permittivity or capacitance) and dielectric loss (conductance) of a substance under oscillating electric field are measured as a function of temperature or time while the substance is subjected to a controlled-temperature program in a specified atmosphere.

**derivative,** *adj*—pertaining to the first derivative (mathematical) of any curve with respect to temperature or time.

**differential,** *adj*—pertaining to a difference in measured or measurable quantities usually between a substance and some reference or standard material.

**differential scanning calorimetry** *(DSC)***,** *n*—A technique in which the heat flow difference 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.

NOTE 3—The record is the differential scanning calorimetric or DSC curve. Two modes, power compensation differential scanning calorimetry, and heat flux differential scanning calorimetry can be distinguished, depending on the method of measurement used.

**differential thermal analysis** *(DTA)***,** *n*—A technique in which the temperature difference between the 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.

NOTE 4—The term *quantitative differential thermal analysis* covers those uses of DTA where the equipment is designed to produce quantitative results.

[1] This terminology is under the jurisdiction of ASTM Committee E37 on Thermal Measurements and are the direct responsibility of Subcommittee E37.03 on Nomenclature and Definitions.

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