



Designation: E 473 – 06

## Standard Terminology Relating to Thermal Analysis and Rheology<sup>1</sup>

This standard is issued under the fixed designation E 473; 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.

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**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. (ICTAC) (1999)

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.

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

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**dilatometry**, *n*—see **Thermodilatometry**.

**dynamic mechanical analysis (DMA)**, *n*—a technique in which the storage modulus (elastic response) and loss modulus (viscous response) of a substance under oscillatory load is measured as a function of temperature, time, or frequency of oscillation, while the substance is subjected to a controlled-temperature program in a specified atmosphere. (ICTAC) (1999)

**evolved gas analysis (EGA)**, *n*—a technique in which the nature and amount, or both, of gas or vapor evolved by a substance is subjected to a controlled-temperature program. (ICTAC) (1999)

NOTE 5—Some specific forms of EGA have become established for investigating different aspects of catalysis, such as reduction, oxidation or desorption. In this context, EGA in a hydrogen atmosphere is known as temperature-programmed reduction (TPR); EGA in an oxygen atmosphere is temperature-programmed oxidation (TPO); and EGA in the absence of decomposition, in an inert atmosphere or vacuum, is temperature-programmed desorption (TPD). For each technique the method used for gas identification and quantification should always be clearly stated.

**evolved gas detection (EGD)**, *n*—see **evolved gas analysis**.

**extrapolated onset point (temperature or time)**, *n*—the temperature or time found by extrapolating the baseline prior to the thermal event to the intersection of a tangent constructed at the inflection point on the leading edge of the thermal event.

**high-pressure (HP...)**, *adj*—a prefix for different thermoanalytical techniques in which the pressure in the apparatus is above ambient. (ICTAC) (1999)

NOTE 6—As an example, high-pressure thermogravimetric analysis is designated HPTGA.

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**peak point (temperature or time)**, *n*—the temperature or time corresponding to the maximum (or minimum) deflection from the baseline of the independent parameter curve.

**rheometer**, *n*—an instrument for measuring rheological properties with a controlled temperature, shear rate or stress program.

**rheometry**, *n*—a technique in which viscosity, storage modulus, and loss modulus of a material are measured as a function of temperature, time, shear rate or stress while the material is subjected to controlled temperature, shear rate or stress program.

**simultaneous**, *adj*—the application of two or more techniques to the same sample at the same time. (ICTAC) (1999)

NOTE 7—A hyphen is used to separate the abbreviations of the techniques; for example, simultaneous thermogravimetric analysis and differential scanning calorimetry would be TGA-DSC.

**$\tan \delta$** , *n*—is the dimensionless ratio of energy lost to energy returned during one cycle of a periodic process.  $\tan \delta$  is normally calculated by dividing the loss component of the property measured by a periodic method by the storage component (for example,  $\tan \delta = E''/E'$  as used in DMA).

**thermal analysis (TA)**, *n*—a group of techniques in which a physical property of a substance is measured as a function of

temperature or time while the substance is subjected to a controlled-temperature program. (ICTAC) (1999)

**thermally stimulated current analysis**, *n*—a technique in which the current generated when dipoles change their alignment in a substance is measured as a function of temperature or time while the substance is subjected to a controlled-temperature program in a specified atmosphere. (ICTAC)

NOTE 8—The technique can be applied in several ways: for example; the substance can be pre-conditioned by heating and cooling in a nonoscillating electric field to create aligned, frozen dipoles. The substance may then generate a thermally stimulated current during subsequent heating with no field applied.

**thermoanalytical**, *adj*—of, or pertaining to, thermal analysis. (ICTAC) (1980)

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NOTE 9—Linear thermodilatometry and volume thermodilatometry are distinguished on the basis of the dimension measured.

**thermogravimetry (TG)**, *n*—see **thermogravimetric analysis**.

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NOTE 10—The record is the thermogravimetric or TG curve. This definition is similar to the ICTAC definition of the term *thermogravimetry*.

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NOTE 11—Thermogravimetric analysis with a magnetic field acting on the specimen is the most common example.

**thermomechanical analysis (TMA)**, *n*—a technique in which the deformation of a substance under nonoscillatory load is measured as a function of temperature or time while the substance is subjected to a controlled-temperature program in a specified atmosphere. (ICTAC)

NOTE 12—The load on the substance may be compressive, tensile, flexural or torsional. When the applied load is too low to cause deformation, TMA measures a dimension of the substance and in this mode is called **thermodilatometry**.

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NOTE 13—Measurement of total light, light of specific wavelength(s), refractive index, and luminescence leads, respectively, to *thermophotometry*, *thermospectrometry*, *thermorefractometry*, and *thermoluminescence*.



Observations under the microscope lead to *thermomicroscopy*.

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