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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Test methods for electrical materials, printed boards and other interconnection structures and assemblies – Part 2-807: Test methods for materials for interconnection structures – Decomposition temperature (T_d) using TGA

Méthodes d'essai pour les matériaux électriques, les cartes imprimées et autres structures d'interconnexion et ensembles – Partie 2-807: Méthodes d'essai des matériaux pour structures d'interconnexion – Température de décomposition (T_d) par analyse thermogravimétrique

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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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CONTENTS

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TEST METHODS FOR ELECTRICAL MATERIALS, PRINTED BOARDS AND OTHER INTERCONNECTION STRUCTURES AND ASSEMBLIES –

Part 2-807: Test methods for materials for interconnection structures – Decomposition temperature (T_d) using TGA

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The text of this International Standard is based on the following documents:

Draft	Report on voting
91/1697/CDV	91/1738/RVC

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC 61189 series, published under the general title *Test methods for electrical materials, printed boards and other interconnection structures and assemblies*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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- amended.

TEST METHODS FOR ELECTRICAL MATERIALS, PRINTED BOARDS AND OTHER INTERCONNECTION STRUCTURES AND ASSEMBLIES –

Part 2-807: Test methods for materials for interconnection structures – Decomposition temperature (T_d) using TGA

1 Scope

This part of IEC 61189 specifies a test method to determine the decomposition temperature (T_d) of base laminate materials using thermogravimetric analysis (TGA).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60194-2, *Printed boards design, manufacture and assembly – Vocabulary – Part 2: Common usage in electronic technologies as well as printed board and electronic assembly technologies*

ISO 11358-1, *Plastics – Thermogravimetry (TG) of polymers – Part 1: General principles*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60194-2 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia available at http://www.electropedia.org/
- ISO Online browsing platform available at https://www.iso.org/obp

4 Test specimens

4.1 Specimens shall be an unclad laminate material or laminate material where the copper has been completely removed.

4.2 The typical weight of the sample is 10 mg to 30 mg. Samples shall be cut to a specified size which is suitable for the sample pan using appropriate procedures and equipment. All edges of the sample shall be finished such that it is smooth and burr-free to allow the sample to rest completely flat on the sample pan. This can be achieved by sanding or equivalent. Use care to minimize the introduction of mechanical stress, and that any sanding medium does not become embedded into the sample.

NOTE 1 Samples of the same mass but with a smaller surface area are likely to lose mass at a slower rate.

NOTE 2 It is recognized that different resin content of the samples is likely to yield different T_d results.

4.3 The specimen shall be preconditioned by baking at 110 °C ± 2 °C for 24 hours and placed in a desiccator for cooling to room temperature (equilibration) prior to testing. The TGA test shall be started within 15 minutes after removing the specimen from the desiccator to minimise moisture being absorbed.

4.4 Unless otherwise specified, one specimen shall be tested. A minimum of three specimens shall be tested as a referee method. For the referee method, the three specimens shall be taken from random locations.

5 Test apparatus

5.1 Thermogravimetric analyzer (TGA), the TGA instrument shall be comprised of the following:

a) microbalance, null type, sensitive to 0,001 mg;

b) furnace, equipped with dry pure nitrogen (moisture less than 5 ppm, oxygen less than 20 ppm) purge;

c) temperature programmer, capable of providing controlled 5 °C or 10 °C per minute heating rate from ambient to 800°C with a tolerance of ± 0,1 °C.

5.2 The TGA shall be capable of determining a mass change to within 0,01 mg.

5.3 The circulating air oven shall be capable of maintaining 110 °C±2 °C.

5.4 Desiccator or low humidity cabinet shall be capable of maintaining an atmosphere less than 30% RH at 23 ± 2 °C.

5.5 A sanding equipment is required to provide specimens edges smooth and burr-free.

5.6 A temperature and humidity meter shall be used to record the environmental temperature and humidity, within ±1 °C and ±1 % RH.

6 Test procedure

6.1 Calibrate the balance of the TGA to within ± 0,01 mg, following the calibration instructions regarding ISO 11358-1 and manufacturer's recommendations.

6.2 Calibrate the temperature sensor to within ± 1,0 °C, following the calibration instructions regarding ISO 11358-1 and manufacturer's recommendations.

6.3 Run the TGA pure nitrogen purge for 30 minutes with a purge rate of 55 cc/min before inserting a sample.

The rate of the gas purification will have a significant effect on the calibration, therefore, the TGA instrument shall be calibrated with the same flow rate as is used during the test. The flow rate should not be changed after it has been calibrated.

6.4 Place the sample in the TGA and measure its mass. The sample should be positioned avoiding to get in contact with temperature sensor during the test procedure.

6.5 Heat the sample at a rate of 5 °C/min or 10 °C/min from ambient (not to exceed 50 °C) to 550 °C.

NOTE The test termination temperature can be appropriately increased for the base laminate materials which have a higher grade heat resistance.

6.6 Record the temperature, at which the mass of the sample is 2,0 % less than its mass measured at 50°C, as the thermal decomposition temperature T_d (2 %).

6.7 Record the temperature, at which the mass of the sample is 5,0 % less than its mass measured at 50°C, as the thermal decomposition temperature T_d (5 %).

6.8 Produce a TGA plot; a typical TGA plot is shown in Figure 1.

6.9 Minimum value of the T_d should be taken when refereeing.

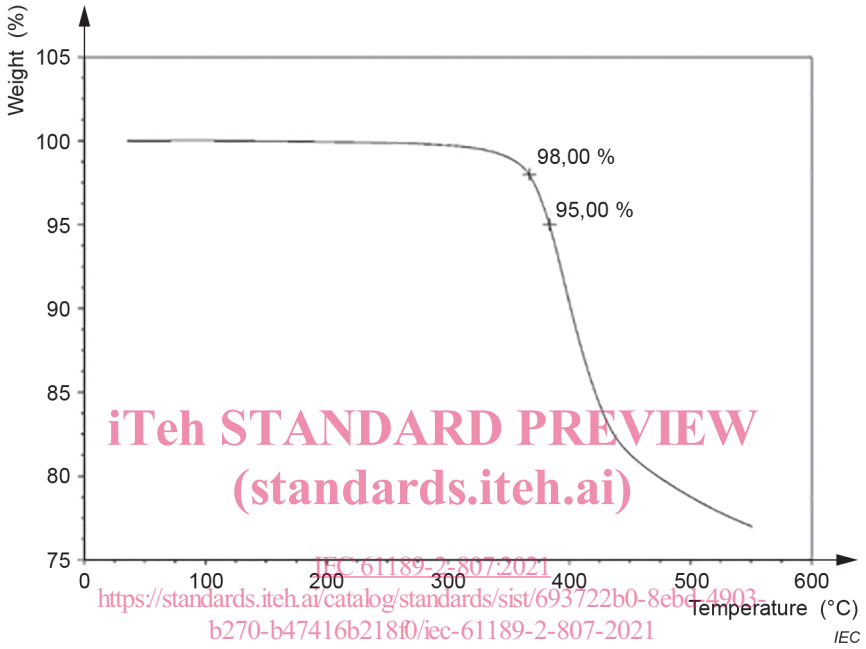

Figure 1 – Mass-temperature curve

7 Report

The report shall include:

a) the test method number and revision level;
b) the identification and description of the material tested;
c) the initial mass of the sample, in mg;
d) the room temperature and relative humidity under which testing was conducted;
e) the heating rate of the test, in °C;
f) the thermal decomposition temperature, T_d (2 %), in °C;
g) the thermal decomposition temperature, T_d (5 %), in °C;
h) the date of the test;
i) any deviation from the test method;
j) the name or type of the used thermogravimetric analyzer;
k) the name of the person conducting the test.

Bibliography

IPC-TM-650, Method 2.3.40 *Thermal Stability*

IPC-TM-650, Method 2.4.24.6 *Decomposition Temperature (T_d) of Laminate Material Using TGA*

ASTM D3850-19, *Standard Test Method for Rapid Thermal Degradation of Solid Electrical Insulating Materials by Thermogravimetric Method (TGA)*