INTERNATIONAL STANDARD

ISO 11248

First edition
1993-12-01

Plastics — Thermosetting moulding materials — Evaluation of short-term performance at elevated temperatures

Plastiques — Matières à mouler thermodurcissables — Évaluation des performances à court terme aux températures élevées

Reference number
ISO 11248:1993(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11248 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 12, *Thermosetting materials*.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Introduction

Plastic materials, when exposed to heat, may undergo physical and/or chemical changes. The extent of such changes is dependent upon temperature and exposure time. These changes may or may not be evident when the plastic materials are returned to ambient temperature.

In ISO 2578:1993, *Plastics — Determination of time-temperature limits after prolonged exposure to heat* and similar standards, testing is carried out at ambient temperature. In such standards it is primarily the permanent effects of thermal oxidation on plastics exposed to elevated temperatures for extended periods of time which are addressed. Undefined, however, are any high-temperature physical and or chemical changes that occur while the materials are exposed to the elevated temperatures. This International Standard is designed to provide data indicating how plastic materials may perform at elevated temperatures under mechanical and/or electrical stress.

INTERNATIONAL STANDARD © ISO **ISO 11248:1993(E)**

Plastics — Thermosetting moulding materials — Evaluation of short-term performance at elevated temperatures

1 Scope

This International Standard specifies a method for the determination of the mechanical, electrical, thermal and other properties of thermosetting moulding materials when tested under defined conditions at elevated temperatures.

The method is used for the determination of the relative performance temperature (RPT) of thermosetting moulding materials. This RPT is necessary in describing the short-term performance of these materials at elevated temperatures. Coupled with the long-term property evaluations of polymeric materials, the RPT provides designers and engineers with a more complete picture of the expected performance of materials in use at elevated temperatures.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 178:1993, *Plastics — Determination of flexural properties.*

ISO 291:1977, *Plastics — Standard atmospheres for conditioning and testing.*

ISO 295:1991, *Plastics — Compression moulding of test specimens of thermosetting materials.*

ISO 527-1:1993, *Plastics — Determination of tensile properties — Part 1: General principles.*

ISO 604:1993, *Plastics — Determination of compressive properties.*

ISO 10724:—[1], *Plastics — Thermosetting moulding materials — Injection moulding of multipurpose test specimens.*

IEC 216-2:1990, *Guide for the determination of thermal endurance properties of electrical insulating materials — Part 2: Choice of test criteria.*

3 Apparatus

3.1 Oven. A forced-draught oven with a controlled horizontal or vertical airflow is recommended. When it is necessary to avoid contamination among materials, a tubular oven may be used.

The oven shall be equipped with suitable specimen racks designed to allow free airflow.

3.2 Test equipment, designed to determine specific properties, and conforming to the requirements of ISO 178, ISO 527-1 and ISO 604, or other standards, as appropriate. The test equipment shall include a suitable forced-draught oven or other suitable means of maintaining the same temperature at which the specimens have been heated in the main oven (3.1).

1) To be published.

4 Sampling

Sampling shall be carried out in accordance with the appropriate International Standards for the particular properties to be tested (see 7.1).

5 Test specimens

5.1 The test specimens shall be in accordance with the appropriate International Standards for the particular properties to be tested (see 7.1).

5.2 The number of specimens tested shall be in accordance with the appropriate International Standards for the particular properties to be tested. In cases of extreme variability, where the standard deviation of the particular test method being used is more than 20 % of the mean value, additional specimens shall be tested.

5.3 All test specimens shall be modified in accordance with the appropriate ISO standards, for example ISO 295 and ISO 10724.

5.4 Post-curing, if desired, shall be carried out in accordance with the manufacturer's recommendations.

6 Conditioning

Specimens to be tested shall be conditioned for 24 h in atmosphere 23/50 as defined in ISO 291.

7 Procedure

7.1 Properties to be tested are specified in ISO 178, ISO 527-1, ISO 604, and others, as appropriate. Guidance to the selection of properties is given in IEC 216-2.

As the effects of heat on different plastic materials may vary with the property being tested, it is recommended that a minimum of one mechanical test, such as flexure or tensile strength, or flexure or tensile modulus, and one electrical test, such as dielectric strength, be used. Additional tests, relevant to the application, may be added to these minimum tests.

7.2 All testing shall be carried out in accordance with the appropriate International Standard for the property being tested (see 7.1), except as modified below.

7.3 One set of specimens from all materials shall be tested under standard temperature and pressure (atmosphere 23/50). These values shall be known as reference values.

7.4 Determine the initial test temperature, in degrees Celsius, as follows:

If dynamic mechanical analysis (DMA) is available, determine the glass transition temperature (T_g) from the peak in the tan δ vs. temperature curve. In the absence of DMA, the deflection temperature under load (DTUL) may be used.

The initial test temperature is defined as the closest temperature, in degrees Celsius, below the temperature determined by DMA or DTUL, which is a whole number multiple of 25.

7.5 Expose the test specimens for 24 h at the initial test temperature and test them at that temperature, after 15 min in the test fixture.

7.6 If the property value obtained at the initial test temperature is less than 50 % of the reference value, reduce the test temperature by 25 °C and expose and test a new set of specimens as in 7.5. Conversely, if the property value obtained at the initial test temperature is greater than 50 % of the reference value, increase the test temperature by 25 °C and expose and test a new set of specimens as in 7.5.

7.7 Continue in 25 °C increments until a minimum of four data points are obtained, at least one of which, but not more than two, is less than 50 % of the reference value.

7.8 Use appropriate data transformations, if necessary, and a linear regression model to determine the best-fit line through the data points. The temperature at which this plot crosses the level corresponding to 50 % of the reference value is defined as the relative performance temperature (RPT).

8 Precision

No statement of precision can be made for this procedure, as it is dependent on the test method used to determine the property in question.

9 Test report

The test report shall include the following information:

a) a reference to this International Standard;

b) the generic type of plastic material and the specific grade being tested;

c) the moulding procedure and moulding parameters used, and the date of moulding;

d) the test temperatures and the type of oven used;

e) the time and temperature of post-curing (if carried out), the properties tested, the test-specimen size and configuration, the number of specimens tested at each temperature, and the date(s) of testing;

f) the reference value and the RPT for each property tested. The data-point plot used to determine the RPT shall be included in the report.

g) the reference value and the RPT for each property tested for post-cured specimens, if post-curing was carried out;

h) any observations of visual changes in the test specimens, such as extreme shrinkage, distortion, cracking, crazing, colour change, etc.

UDC [678.5+.7].027.7:620.1

Descriptors: plastics, thermosetting materials, thermosetting resins, plastic moulding, tests, performance tests, high temperature tests.

Price based on 3 pages