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Cellular plastics — Determination of horizontal burning characteristics of small specimens subjected to a small flame

Plastiques alvéolaires — Détermination des caractéristiques de combustion de petites éprouvettes en position horizontale, soumises à une petite flamme

ICS: 83.100; 13.220.40

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 9772 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 4, *Burning behaviour*.

This fourth edition cancels and replaces the third edition (ISO 9772:2012), which has been technically revised.

Introduction

Cellular plastics are widely used in products for packaging, building, housing, industry and transport, in various applications. The burning behaviour of cellular plastics is a concern for the fire safety of these products. This International Standard gives a method for the determination of the burning behaviour of cellular plastics using a small flame source.

The burning behaviour of cellular plastics is influenced by the test specimen orientation (vertical or horizontal). This method of test evaluates specimens which are oriented horizontally.

The method described is also intended as a pre-selection test for materials used for components of devices and appliances. The final acceptance of the material will be dependent upon its use in complete equipment that conforms with the standards applicable to such equipment.

It should be noted that the test results obtained by the test specified in this International Standard alone cannot represent all the aspects of the fire hazard of cellular plastics in end-use conditions.

Cellular plastics — Determination of horizontal burning characteristics of small specimens subjected to a small flame

1 Scope

1.1 This International Standard specifies a small-scale laboratory screening procedure for comparing the relative burning characteristics of horizontally oriented, small cellular plastic specimens having a density less than 250 kg·m^{-3} determined in accordance with ISO 845, when exposed to a small-flame ignition source.

NOTE Another International Standard exists covering flexible cellular plastic and cellular rubber: ISO 3582[2].

1.2 This method of test is intended for quality assurance and limited product evaluation of cellular plastic materials under controlled laboratory conditions, and is not intended to assess the fire behaviour of e.g. building materials or furnishings under actual fire conditions.

1.3 The optional classification system described in Annex A is intended for the pre-selection of cellular plastic materials for products, including the determination of the ranges of material parameters that give the same classification (see 6.1).

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 845, *Cellular plastics and rubbers — Determination of apparent density*

ISO 1923, *Cellular plastics and rubbers — Determination of linear dimensions*

ISO 10093, *Plastics — Fire tests — Standard ignition sources*

ISO 13943, *Fire safety — Vocabulary*

ASTM E2016, *Standard Specification for Industrial Woven Wire Cloth*

3 Terms and definitions

For the purposes of this International Standard, the terms and definitions given in ISO 13943 and the following apply.

3.1
afterflame
flame that persists after the ignition source has been removed

[SOURCE: ISO 13943]

3.2
afterflame time
length of time for which an afterflame persists under specified conditions

[SOURCE: ISO 13943]

3.3
afterglow
persistence of glowing combustion after both removal of the ignition source and the cessation of any flaming combustion

[SOURCE: ISO 13943]

3.4
afterglow time
length of time for which an afterglow persists under specified conditions

[SOURCE: ISO 13943]

3.5
extended application of test results
process of predicting a test result, on the basis of one or more existing test results obtained by the same test, for a product for which a property and/or the intended end-use application(s) are subject to variation

3.6
draught-free environment
space in which the results of experiments are not significantly affected by the local air speed

4 Significance of test

4.1 Tests conducted on a material under the conditions specified can be of considerable value when comparing the horizontal burning characteristics of different materials, controlling manufacturing processes or assessing any changes in formulation or treatment prior to use.

4.2 Assessment of fire hazard requires consideration of factors such as fuel contribution, intensity of burning (rate of heat release) and products of combustion, as well as environmental factors such as intensity of source, orientation of exposed material and ventilation conditions.

4.3 Horizontal burning characteristics, as measured by this test procedure, might be affected by factors such as density, any anisotropy of the cellular material, its melting characteristics, its colour and its thickness.

4.4 Certain materials might shrink from the applied flame without igniting. In this event, the test results are not valid, and additional test specimens will be required to obtain 10 valid test results. If this proves impossible due to non-ignition of all the specimens, then this test is not suitable for these materials.

4.5 The horizontal burning characteristics of some cellular plastic materials might change with time, and tests are therefore conducted before and after heat ageing.

5 Apparatus

5.1 A laboratory fume hood, having an inside volume of at least 0,5 m^3 is used. The chamber shall permit observation of tests in progress and shall provide a draught free environment whilst allowing normal thermal circulation of air past the test specimen during burning. The inside surfaces of the chamber shall

be of a dark colour. When a light meter, facing towards the rear of the chamber, is positioned in place of the test specimen, the recorded light level shall be less than 20 lux.

For safety and convenience, this enclosure (which can be completely closed) shall be fitted with an extraction device, such as an exhaust fan, to remove products of combustion that might be toxic. The extraction device shall be turned off during the test and turned on again immediately after the test to remove the fire effluents. A positive closing damper might be needed.

NOTE The amount of oxygen available to support combustion is naturally important for the conduct of these flame tests. For tests conducted by this method when burning times are protracted, chamber sizes greater than 0,5 m^3 might be needed to provide reproducible results.

5.2 P/PF2 laboratory burner, as specified in IEC 60695-11-3, having a barrel length of (100 ± 10) mm and an internal diameter of (9,5 ± 0,3) mm. The barrel shall not be equipped with an end attachment, such as a stabilizer.

5.3 The burner shall be fitted with a **Burner wing top**, having an opening of internal length (48 ± 1) mm and internal width (1,3 ± 0,05) mm (see Figure 1).

To ensure the wing top opening is uniform in width, one option is to slide a (1,3 ± 0,05) mm steel wire or spacer along its length.

5.4 The **Support gauze** shall be a wire cloth of plain weave, approximately 215 mm long by 75 mm wide, as shown in Figure 2. It shall consist of (6,4 ± 0,5) mm mesh gauze constructed of (0,9 ± 0,1) mm diameter stainless steel, plain or low carbon steel wire. The cloth-mesh and wire diameter are to be determined as described in the Standard Specification for Industrial Woven Wire Cloth, ASTM E2016.

5.5 The gauge-support holder shall consist of two laboratory ring stands with clamps adjustable to the desired angles and heights. The gauze-support holder shall be constructed from aluminium or steel and shall satisfy the following conditions:

— the long axis of the gauze shall be maintained to within 1° of the horizontal;

— the nearest end of the specimen shall be (13 ± 1) mm above the burner wing top (see Figure 2);

— the space both above and below the specimen shall not be obstructed;

— a means shall be provided for positioning the burner in the correct location relative to the specimen, preferably with a sliding mechanism and a stop to allow fast movement of the burner flame towards and away from the specimen;

— the gauze shall be equidistant from the front and back, and from both sides, of the test chamber, and shall be (175 ± 25) mm above the cotton indicator base-board (see Figure 2).

5.6 There shall be two timing devices, each of which reads to within 1 s or less.

5.7 A **Measuring scale** graduated in millimetres, shall be used to measure the length, width and thickness of the test specimen.

5.8 A **Gas supply** shall, supply technical-grade methane gas with a purity of at least 98 % and having a heat content of (37 ± 1) $MJ·m^{-3}$, with regulator and meter to ensure uniform gas flow.

Other gas mixtures having a heat content of approximately (37 ± 1) $MJ·m^{-3}$ or propane having a heat content of (94 ± 2) $MJ·m^{-3}$ have been shown to provide similar results when using the procedure of Clause 8. In cases of dispute, however, technical-grade methane shall be used.

5.9 A **Manometer and gas flow meter**, calibrated for the gas used and capable of reading the values shown in Table 1 shall be used.

5.10 A **Cotton indicator**, consisting of a pad of dry, absorbent 100 % cotton measuring approximately 75 mm long, 75 mm wide and 6 mm thick and having a mass of approximately 0,18 g, shall be used.

5.11 A **Desiccator**, containing anhydrous calcium chloride or another drying agent which can be maintained at (23 ± 2) °C and gives a relative humidity not exceeding 20 % shall be used.

5.12 A **Conditioning room or chamber**, capable of being maintained at (23 ± 2) °C and a relative humidity of (50 ± 10) % shall be used.

5.13 An **Air-circulating oven**, giving a minimum of five air-changes per hour, and capable of being maintained at (70 ± 2) °C or another agreed temperature shall be used.

5.14 A **Dial-gauge micrometer**, for measuring the specimen thickness, with a 650 mm^2 pressure foot exerting a pressure of (0,175 ± 0,035) kPa shall be used.

5.15 A **Cotton indicator base-board**, measuring approximately 215 mm long and 75 mm wide and having a height such that the distance between the support gauze and the top of the base-board is (175 ± 25) mm shall be used.

The cotton indicator base-board shall be made of non-combustible board having a dry density of (850 ± 200) $kg \cdot m^{-3}$. It shall not be made of metal.