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**Sensory analysis — Methods for  
assessing modifications to the flavour  
of foodstuffs due to packaging**

*Analyse sensorielle — Méthodes pour évaluer les modifications de la  
flaveur des aliments causées par l'emballage*

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Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

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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 13302 was prepared by Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 12, *Sensory analysis*.

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## Introduction

It is necessary to prevent materials intended for the packaging of foodstuffs from being the cause of unwanted alterations in odour or flavour. Likewise, it is necessary to take into account the storage conditions of the foodstuffs once they are packed since this can also be one of the causes of modifications to odour or flavour.

Certain types of foodstuff are particularly susceptible to flavour modifications due to packaging materials (e.g. fatty or powdered products having a large area in contact with the packaging). In particular, the packaging material can contaminate the product by transfer. This transfer can occur by direct contact with the packaging material or, indirectly, by means of the atmosphere created between the packaging and the product. Foreign odours or flavours can also come from the inner or outer layers of the packaging material.

The packaging material can also absorb compounds from foodstuffs and cause modifications of flavours.

Food industries should ensure that the packaging they use is the best possible choice with respect to their products. This is why they must have at their disposal methods which allow them to ascertain that the flavour of the foodstuffs is not significantly modified under certain storage conditions.

Compounds transferred from packaging materials and responsible for undesired effects on the flavour of food products are usually in very low quantities, often below the detection limits of the analytical techniques, or simply the compounds responsible for the changes in flavour have not been identified. Thus, it is necessary to evaluate the sensory properties of packaging materials.

This International Standard describes two complementary tests which are not mutually exclusive:

- assessment of the inherent odour of the packaging material under test (odour test);
- assessment of the change of flavour of a foodstuff after direct or indirect contact with the packaging material under test in actual conditions or in simulated conditions (contact test).

This International Standard was developed by a group composed of sensory analysis experts and experts from the packaging sector and is based on their experience.

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# Sensory analysis — Methods for assessing modifications to the flavour of foodstuffs due to packaging

## 1 Scope

This International Standard describes methods for assessing the changes caused by packaging to the sensory attributes of foodstuffs or their simulants.

The methodology can be used as initial selection to assess a suitable packaging material or as subsequent acceptability screening of individual batches/production run (see Annex A).

This International Standard is applicable to all materials usable for packaging foodstuffs (e.g. paper, cardboard, plastic, foils, wood). Moreover, the scope can be extended to any objects intended to come into contact with foodstuffs (e.g. kitchen utensils, coatings, leaflets, or parts of equipment such as seals or piping) with the aim of controlling food compatibility from a sensory point of view according to the legislation in force.

## 2 Normative references

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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 483:1988, *Plastics — Small enclosures for conditioning and testing using aqueous solutions to maintain relative humidity at constant value*

ISO 4120, *Sensory analysis — Methodology — Triangle test*

ISO 5492, *Sensory analysis — Vocabulary*

ISO 5495:1983, *Sensory analysis — Methodology — Paired comparison test*

ISO 6564, *Sensory analysis — Methodology — Flavour profile methods*

ISO 8586-1, *Sensory analysis — General guidance for the selection, training and monitoring of assessors — Part 1: Selected assessors*

ISO 8586-2, *Sensory analysis — General guidance for the selection, training and monitoring of assessors — Part 2: Experts*

ISO 8587:1988, *Sensory analysis — Methodology — Ranking*

ISO 8589, *Sensory analysis — General guidance for the design of test rooms*

ISO 11035, *Sensory analysis — Identification and selection of descriptors for establishing a sensory profile by multidimensional approach*

ISO 10399, *Sensory analysis — Methodology — Duo-trio test*

ISO 13299, *Sensory analysis — Methodology — General guidance for establishing a sensory profile*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5492 and the following apply.

#### 3.1 packaging

object intended for wrapping or containing, temporarily, a product or series of products during handling, transportation, storage or presentation, with a view to preserving, protecting or facilitating these operations

NOTE This International Standard covers packaging coming into direct contact with foodstuffs.

#### 3.2 new packaging

any packaging in which at least one of the constituent elements (e.g. nature of the material, adhesives, inks, solvents, varnishes) is new or has been modified

#### 3.3 odour

sensory attribute perceptible by the olfactory organ on sniffing certain volatile substances

#### 3.4 flavour

complex set of olfactory, gustatory and trigeminal sensations perceived during the course of the tasting

NOTE The flavour can be influenced by somaesthetic (tactile, thermal, algescic and/or kinesthetic) impressions.

#### 3.5 taint

flavour which is foreign to the foodstuff

#### 3.6 off-flavour

atypical flavour of the foodstuff, often associated with the deterioration of the foodstuff

#### 3.7 reference material

packaging material which does not interfere with the sensory properties of a product

NOTE The reference material could be an approved packaging that already exists which complies with the legislation in force.

#### 3.8 assessor

(sensory) any person taking part in a sensory test

NOTE A naïve assessor is a person who does not meet any particular criterion. An initiated assessor is a person who has already participated in a sensory test.

#### 3.9 selected assessor

(sensory) assessor chosen for his/her ability to perform a sensory test

#### 3.10 expert

(general sense) a person who, through knowledge or experience, has competence to give an opinion in the fields about which he/she is consulted

NOTE In sensory analysis, there are two types of expert, the "expert assessor" and the "specialized expert assessor", in conformity with ISO 8586-2.



**3.10.1****expert assessor**

selected assessor with a high degree of sensory sensitivity and trained in the use of sensory analysis methods and who is able to make consistent and repeatable sensory assessments of various products

**3.10.2****specialized expert assessor**

expert assessor who has additional experience as a specialist in the product and/or process and/or marketing, and who is able to perform sensory analysis of the product and to evaluate or predict effects of variations relating to raw materials, recipes, processing, storage, ageing, etc.

**4 Principle****4.1 Assessment of the inherent odour of the packaging material**

The packaging material under test is stored in a container under controlled conditions.

The odour of the atmosphere developed upon confinement is assessed by means of sensory analysis methods.

**4.2 Assessment of the effect of the packaging material on the flavour of the foodstuff**

The foodstuff and the packaging material under test, with direct or indirect contact, are stored in a container under controlled conditions.

The flavour changes of the foodstuff are assessed by means of sensory analysis methods.

**5 Foodstuff samples**

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**5.1 General**

**CAUTION — Hygienic and safety requirements related to the products used shall be followed.**

When possible, use the actual foodstuff, method of packing and storage conditions (temperatures, contact time, etc.) for the tests. This is highly recommended for tests performed at the development level.

For repeated tests with a panel, use, if possible, the same foodstuff references (same product and same trade name). In the other cases, use a similar foodstuff which approximates the real product.

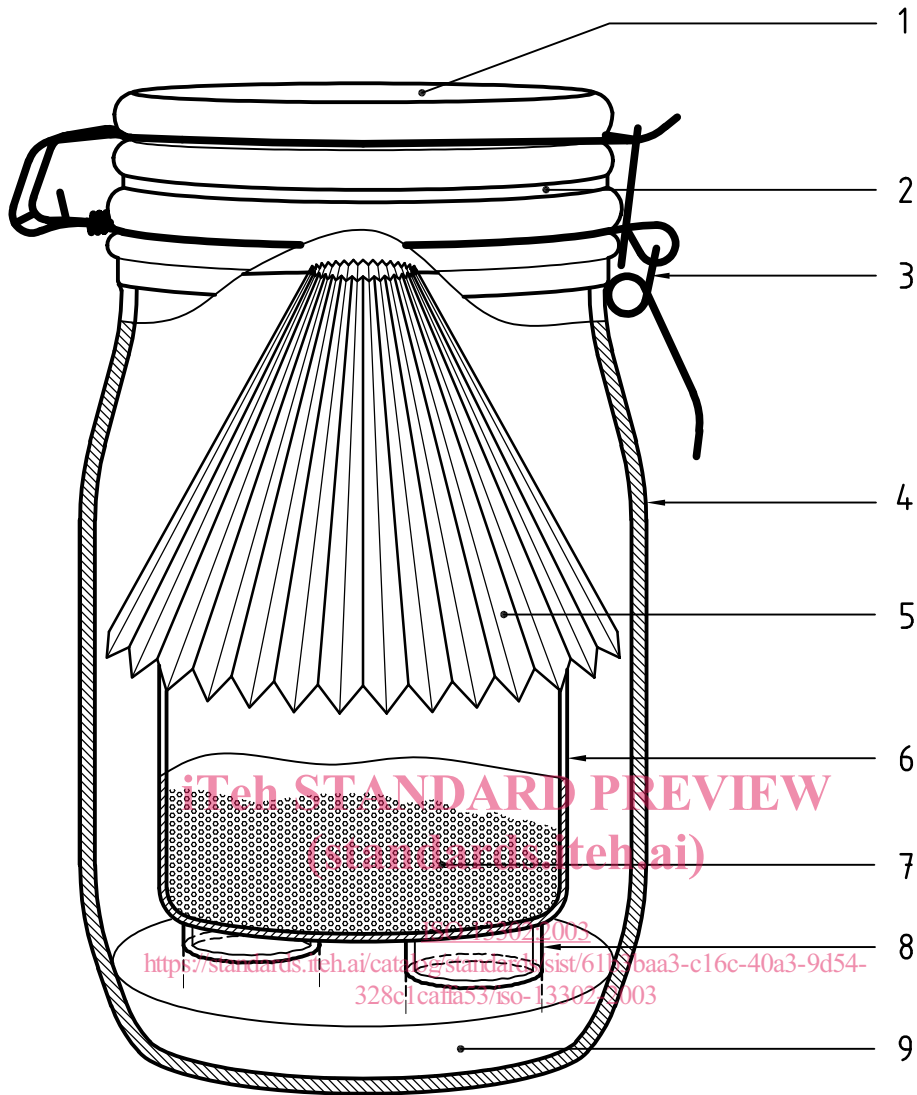
It is sometimes necessary to decrease the leading time or to use a model foodstuff when actual foodstuffs are not known and/or actual storage conditions are not achievable.

To date, the sole validated model concerns offset printed paper/cardboard used for chocolate products:

- grated milk chocolate
  - relative humidity, 75 %,
  - temperature, 23 °C ± 2 °C,
  - duration, 48 h (adapted from the Robinson test <sup>[14]</sup>).

The set-up is shown in Figure 1. The interpretation of this model is limited because it does not take into account the ratio of the foodstuff mass to the packaging surface.

Proposals for other non-validated models are given in Annex C.



**Key**

- |  |  |
|--|--|
| 1 glass lid  | 6 glass crystallizing dish (diameter 8 cm) |
| 2 polytetrafluoroethylene [Teflon® <sup>1)</sup> ]   | 7 grated milk chocolate (25 g)             |
| 3 metal clip   | 8 glass rings                              |
| 4 glass jar (1 000 ml)                               | 9 saturated NaCl solution (60 ml)          |
| 5 packaging material under test (6 dm <sup>2</sup> ) |  |

**Figure 1 — Set-up for testing paper/cardboard**

1) Teflon® is an example of a suitable product available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of this product. Equivalent products may be used if they can be shown to lead to the same results.

## 5.2 Preparation of samples

Provide the amount of sample material needed for each assessor.

The quantity varies according to the foodstuff concerned and is, in general,

- 4 g to 30 g for solid foodstuffs, and
- 15 ml to 50 ml for liquid foodstuffs.

Adapt the number of containers to the panel size (see 6.3).

## 6 Samples of packaging materials

### 6.1 General

Prior to conducting the tests, preserve the packaging materials under cold conditions (at approximately 5 °C) and wrapped in an uncoated sheet of aluminium foil or in an airtight glass container.

For sheet or film type materials, sample representative material specimens and eliminate the outer layers (e.g. initial turns of a roll, first and last sheets of a pile).

### 6.2 Preparation of the packaging material samples for assessment of inherent odour

#### 6.2.1 Test conditions

Use actual conditions if they are known.

If they are not known, proceed as follows. [ISO 13302:2003](https://standards.iteh.ai/catalog/standards/sist/61b3baa3-c16c-40a3-9d54-328c1caffa53/iso-13302-2003)

- a) For flexible, single-layered materials, the material surface area/container volume ratio recommended is 6 dm<sup>2</sup>/l. In the case of printed material, care should be taken to maintain about the same ratio between the printed and unprinted surfaces in the section to be tested.
- b) With laminated or multilayered materials with essential differences between the surfaces being separated by a practically impermeable inner layer, especially in the case of printed samples, the test should be carried out on one side, namely, on the side designed for contact with the packaged food product. Produce shape tetrahedrons or bags to test their interior (e.g. 6 dm<sup>2</sup>). Bags may be either sealed (with respect to sealing conditions recommended by industrialists) or closed with adhesives which will not impart odour to the interior.
- c) Rigid materials may be cut into pieces provided that no modification to the structure of the material occurs.

It is important always to follow the same procedure once it has been selected.

#### 6.2.2 Method

Where possible, for each sample, provide one container for each of the assessors taking part in the test (see Annex B for recommended containers).

Insert into each container the appropriate surface area of packaging material.

If there is a visual difference, make sure that the material placed in the container is not visible from the outside (e.g. cover the container with aluminium foil).

Keep all prepared containers in a dark place for 24 h at 23 °C ± 2 °C or, if a rough evaluation is needed, 1 h at 40 °C ± 2 °C.

**6.2.3 Reference sample**

If a reference sample is needed, use the reference material by treating it in the same way as the test material. The reference packaging material used in this case is a material that does not interfere with the sensory properties of the foodstuff (3.7).

If no reference packaging material exists or optimum quality conditions are desired, it is possible to prepare the reference sample without the packaging, by simply using the same container type without any packaging material.

**6.3 Preparation of the packaging material samples for assessment of the effect on the flavour of the foodstuff**

**6.3.1 Simulation tests with direct contact**

Whenever possible, use actual conditions. If actual conditions are not known or not achievable, use simulation tests as described below. See Annex C for use of simulants.

**a) Liquid foodstuffs**

See Table 1 for the recommended conditions of contact as a function of the different materials to be tested. Applicable conditions for each type of material are represented by a grey area.

The surface area of material in contact/volume of test foodstuff ratio, except for special conditions (e.g. migration cell 2 dm<sup>2</sup> per 200 ml), shall be 6 dm<sup>2</sup> per litre of substance.

**b) Solid foodstuffs**

For materials in sheet or film form, make a sandwich with 2 dm<sup>2</sup> of packaging material in contact with a 1 cm layer of the test foodstuff (cut strips from the film and interlace with the foodstuff). Provide a sufficient quantity of the product for the assessors.

For fillable objects, fill up to the normal capacity and cover the objects over with a glass Petri dish cover.

**Table 1 — Recommended conditions of contact**

Material	Immersion	Cell <sup>a</sup>	Bag	Filling
Unprinted single-layer materials	<i>t</i> <sup>b</sup> > 0,5 mm, 3 dm <sup>2</sup> /l <i>t</i> < 0,5 mm, 6 dm <sup>2</sup> /l <sup>c</sup>			
Printed single-layer or multilayer materials				
Fillable objects				6 dm <sup>2</sup> /l <sup>c</sup>
Plugs and closing systems				
<sup>a</sup> Migration cell type (one single side in contact). <sup>b</sup> <i>t</i> is the thickness. <sup>c</sup> See reference [17] for details.				