

INTERNATIONAL STANDARD

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Paints and varnishes — Testing of formaldehyde-emitting coatings and melamine foams — Determination of the steady-state concentration of formaldehyde in a small test chamber

Peintures et vernis — Essais des revêtements et mousses mélamines qui émettent du formaldéhyde — Détermination de la concentration à l'équilibre du formaldéhyde dans une petite chambre d'essai



Foreword

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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 15234 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 10, *Test methods for binders for paints and varnishes*.

Annexes A and B form an integral part of this International Standard. Annex C is for information only.



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Paints and varnishes — Testing of formaldehyde-emitting coatings and melamine foams — Determination of the steady-state concentration of formaldehyde in a small test chamber

1 Scope

This International Standard specifies a test method for determining the equilibrium concentration of formaldehyde from formaldehyde-emitting coatings and melamine foams in a small test chamber.

It describes the determination of the equilibrium concentration of formaldehyde that is established in air at 23 °C and 50 % relative humidity. The test closely simulates practical conditions and can be performed on a laboratory scale. Good correlation is obtained with values obtained on samples of the same material in a 40 m³ test chamber. The method, which is simple to perform, is therefore suitable for the preliminary determination of limits that have to be adhered to.

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 3270:1984, *Paints and varnishes and their raw materials — Temperatures and humidities for conditioning and testing*.

ISO 3696:1987, *Water for analytical laboratory use — Specification and test method*.

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 equilibrium concentration

C_{eq}
the concentration of formaldehyde in the air in the test chamber that is reached when several successive values of the concentration determined at one-hour intervals differ by less than 0,02 mg/m³

3.2 air-replacement rate

n

the number of air changes per hour in the test chamber, given by

$$n = \frac{V_t}{t \times V}$$

where

V_t is the volume, in cubic metres, of air passed through the test chamber during the test;

t is the duration, in hours, of the test;

V is the volume, in cubic metres, of the test chamber

3.3 relative specimen area

a

the area of formaldehyde-emitting surface per unit volume of the test chamber, given, in square metres per cubic metre (i.e. m^{-1}), by

$$a = \frac{A}{V}$$

where

A is the area of the specimen, in square metres (see annexes A and B);

V is the volume, in cubic metres, of the test chamber

3.4 steady-state ratio

n/a

the ratio of the air-replacement rate n to the relative specimen area a , given, in metres per hour, by

$$n/a = \frac{V_t}{t \times A}$$

where

V_t is the volume, in cubic metres, of air passed through the test chamber during the test;

t is the duration, in hours, of the test;

A is the area, in square metres, of the specimen

3.5 formaldehyde concentration

c

the concentration, in milligrams per cubic metre, of formaldehyde at a given steady-state ratio n/a over the period of time concerned, given by

$$c = \frac{m}{V_t}$$

where

m is the mass, in milligrams, of formaldehyde;

V_t is the volume, in cubic metres, of air passed through the test chamber during the test

NOTE The value determined for c can be converted into ppm by dividing by the density of formaldehyde, i.e. by 1,22 g/l at a temperature of 23 °C and an atmospheric pressure of 101,3 kPa.

4 Principle

Test specimens are conditioned at $(23 \pm 1) ^\circ\text{C}$ and $(50 \pm 3) \%$ relative humidity and exposed under specified conditions in a small test chamber (desiccator).

The desiccator is set up in an air-conditioned room so that air from the room can be passed first through the desiccator and then into a water trap where formaldehyde (HCHO) is absorbed. The water in the water trap is changed at regular intervals, and the formaldehyde concentration c is determined photometrically by the acetylacetone method or another suitable method. The test is continued until the value measured for c no longer changes (see 3.1). The equilibrium concentration c_{eq} in the air in the test chamber is then considered to be attained.

5 Choice of method for determination of formaldehyde

The acetylacetone method has been chosen as the preferred method. Other methods of determination, e.g. a fluorimetric method, may be used instead of the photometric method with acetylacetone, provided they can be shown to give equivalent results. (See also annex C, clause C.7.)

6 Apparatus

Ordinary laboratory apparatus and glassware, together with the following:

6.1 Air-conditioned room or similar facility, maintained at a temperature of $(23 \pm 1) ^\circ\text{C}$ and a relative humidity of $(50 \pm 3) \%$.

6.2 Apparatus (see figure 1) consisting of

- two gas-metering pumps, rate of pumping at least 100 l/h, pressure head dependent on pressure requirements,
- bubble counter;
- 1 000 ml bottle with modified wash-bottle insert;
- test chamber, volume 20 l, such as a desiccator, with lid containing a wire cage for the specimens;
- hygrometer;
- two 30 ml wash-bottles with Muenke fitting, or other suitable absorption vessels;
- 500 ml wash-bottle filled with silica gel to act as a drying tower;
- flowmeter, measuring range 0 l/h to 100 l/h; with fine-control valve;
- integrating flowmeter, operating range 1 l/h to 220 l/h.