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Lesne plošče - Ugotavljanje sproščanja formaldehida - 2. del: Ugotavljanje sproščanja formaldehida s plinsko analizo

Wood-based panels - Determination of formaldehyde release - Part 2: Gas analysis method

Holzwerkstoffe - Bestimmung der Formaldehydabgabe - Teil 2: Formaldehydabgabe nach der Gasanalyse-Methode

Panneaux à base de bois - Détermination du dégagement de formaldéhyde - Partie 2: Méthode d'analyse de gaz

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Wood-based panels - Determination of formaldehyde release - Part 2: Gas analysis method

Panneaux à base de bois - Détermination du dégagement de formaldéhyde - Partie 2: Méthode d'analyse de gaz

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (prEN 717-2:2011) has been prepared by Technical Committee CEN/TC 112 “Wood-based panels”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 717-2:1994.

The objective of the revision was to improve the detection limit and the reproducibility of the method with regard to low boards with low formaldehyde content.

Compared to EN 717-2:1994 the following modifications have been made:

a) in 6.1 preparation of test pieces described more in detail;

b) in 6.2 provision of maximum time 72 h after sampling for formaldehyde determination added;

c) in 6.4 conditioning for sampling and testing in case of dispute added;

d) in 7.1 and 8.2.2 procedure and evaluation of third determination modified;

e) provisions for determination of moisture content deleted;

f) in 7.2 use of smaller gas wash bottles and volumetric flasks to improve the sensitivity included as an option;

g) in 7.3.3 higher amounts of aqueous solution to improve the sensitivity included as an option;

h) in 7.3.3 temperature of water bath increased to 60 °C and cooling procedure modified;

i) in 7.3.4.1 minimum interval of check of the calibration curve extended to once a month;

j) in clause 9 age and treatment of the sample included in the test report;

k) in Figure 2 calibration curve modified;

1 Scope

This European Standard specifies a procedure for determination of accelerated formaldehyde release from wood-based panels using the gas analysis method. The procedure is also suitable for the testing of other materials (e.g. edge bands, floor coverings, foams, foils, laminated wood products).

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.

EN 322, *Wood-based panels — Determination of moisture content*

EN 326-1, *Wood-based panels — Sampling and cutting of test pieces*.

3 Principle

A test piece of known surface area is placed in a closed chamber in which the temperature, humidity, airflow and pressure are controlled to defined values. Formaldehyde released from the test pieces mixes with the air in the chamber. This air is continually drawn from the chamber and passes through gas wash bottles, containing water, which absorbs the released formaldehyde. At the end of the test, the formaldehyde concentration is determined photometrically. The formaldehyde release is calculated from this concentration, the sampling time and the exposed area of the test pieces and is expressed in milligrams per square meter and hour (mg/m^2 h).

4 Reagents

4.1 General

Reagents of recognized analytical purity and distilled or demineralised water (referred throughout the following text as distilled water) shall be used for the analysis.

4.2 Acetylacetone solution

4 ml acetylacetone are added to a 1 000 ml volumetric flask and made up to the mark with distilled water.

4.3 Ammonium acetate solution

200 g ammonium acetate are dissolved with distilled water in a 1 000 ml volumetric flask and made up to the mark.

NOTE Optionally, a premixed reagent of acetylacetone and ammonium acetate as described in ISO 12460-4:2008, 4.1 may be used.

4.4 Formaldehyde solution

Commercially available formaldehyde solution (concentration typically between 35 % to 40 %)

4.5 Standard iodine solution

$c(I_2)$ = 0,05 mol/l

4.6 Standard sodium thiosulphate solution

$c(Na_2S_2O_3)$ = 0,1 mol/l

4.7 Standard sodium hydroxide solution

c(NaOH) = 1 mol/l

4.8 Standard sulphuric acid solution

$c(H_2SO_4)$ = 1 mol/l

4.9 Starch solution

1 % by mass

5 Apparatus

5.1 The test apparatus (see Figure 1) comprises the following main components:

5.1.1 Air filter (1).

5.1.2 Wash bottle, 500 ml, containing ca. 400 ml distilled water (2).

5.1.3 Desiccator, 500 ml, containing silica gel (3).

5.1.4 Air pump (4).

5.1.5 Needle valve (5).

5.1.6 Equipment for measuring rate of air flow through apparatus (6).

5.1.7 Test chamber (diameter: 90 mm to 100 mm with a length which gives an internal volume of (4 000 ± 200) ml with double casing of stainless steel or glass (7).

5.1.8 Heating equipment for air (e.g. copper coil inside the double casing) (8).

5.1.9 Thermostat (9).

5.1.10 Magnetic valves (10).

5.1.11 4 pairs of gas wash bottles, 100 ml or optionally 4 pairs of gas wash bottles, 30 ml (21).

5.1.12 Pressure monitor (22).

5.1.13 Temperature monitor (23).

NOTE The test apparatus described in Figure 1 is based on a waterborne heating system. A test apparatus with an electrical heating system can be used optionally.

5.2 Laboratory equipment

5.2.1 Ventilated oven, as described in EN 322.

5.2.2 Spectrophotometer with cells of 50 mm optical path length and capable of measuring absorbance at 412 mm.

5.2.3 Water bath, capable of maintaining a temperature of (60 ± 1) °C.

5.2.4 Water bath, capable of maintaining a temperature in the range of 20 °C to 25 °C

5.2.5 6 volumetric flasks, 100 ml (calibrated at 20 °C).

5.2.6 4 volumetric flasks, 250 ml, or optionally 4 volumetric flasks, 100 ml (calibrated at 20 °C).

5.2.7 2 volumetric flasks, 1 000 ml (calibrated at 20 °C).

5.2.8 Volumetric pipettes (calibrated at 20 °C), 1 ml, 2 ml, 5 ml, 10 ml, 15 ml, 20 ml, 25 ml, 50 ml, 100 ml.

5.2.9 6 flasks, 50 ml, (with stoppers).

5.2.10 Microburette.

5.2.11 Burette, 50 ml, graduated (calibrated at 20 °C).

5.2.12 Balance, capable of measuring to 0,001 g.

6 Sampling and preparation of test pieces

6.1 Preparation of test pieces

Three test pieces, each with the dimensions of (400 ± 1) mm × (50 ± 1) mm x board thickness shall be prepared for the determination of formaldehyde release, giving a total emitting surface area of 0,04 m^2.

NOTE If the sample available does not allow the preparation of test pieces of the specified dimension, then the combined emitting surface area of the test pieces(s) should be as close as possible to 0,04 m^2.

Each test piece has to be hermetically wrapped immediately after cutting and stored at ambient temperature.

Before testing, each test piece shall be stored, hermetically wrapped, at least one day at ambient temperature. For factory production control with hot test pieces, a valid correlation has to be established.

For testing, the test pieces shall be edge sealed with temperature resistant (i.e. ≥ 60 °C) self-adhesive aluminium tape. The emitting (unsealed) surface area of the sealed test piece has to be measured and calculated, in square metres (m^2).

6.2 Selection of test pieces for factory production control

Sampling and cutting of the test pieces shall be performed according to the principles of EN 326-1.

Test pieces are taken uniformly distributed over the width of the (cooled) board, but excluding a 500 mm wide strip at each end of the board.

The formaldehyde determination should be carried out not more than 72 h after sampling.

6.3 Selection of test pieces for other purposes (not covered by 6.2 and 6.4)

The procedure of sampling, preparation of the test pieces and conditioning (e.g. from boards already installed) shall be noted and described in the test report. The number and dimensions of the test pieces shall be as given in 6.1.

6.4 Selection of test pieces in case of dispute

If this method is used in case of dispute e.g. linked to disagreement about compliance and not otherwise agreed upon, the conditioning of the test pieces shall be carried out according to the following reference conditions.

The test pieces shall be conditioned to constant mass at a temperature of (20 ± 1) °C and a relative humidity of (65 ± 5) °C.

Constant mass is considered to have been reached when the results of two successive weighings, carried out at intervals of not less than 24 h, do not differ by more than 0,1 % of the mass of the test pieces. Alternative two weeks of conditioning can be used.

Contamination of test pieces from other sources of formaldehyde during conditioning shall be avoided.

7 Procedure

7.1 Number of determinations

Determination shall always be made in duplicate using two different test pieces prepared according to 6.1. A third determination shall be carried out,

— if the average emission value of the two determinations is > 1,0 mg/m^{2}h and the two replicates deviate more than 15 % of the average value

or

— if the average emission value of the determinations is < 1,0 mg/m^{2}h and the two replicates deviate more than 0,2 mg/ m^{2}h of the average value.

NOTE For internal inspection a single determination can be sufficient.

7.2 Determination of formaldehyde release

Seal the edges of the test pieces in accordance with 6.1.

Close chamber (5.1.7) and pre-heat it to (60 ± 0,5) °C.

Connect two gas wash bottles (see 5.1.11), each containing between 20 ml and 30 ml distilled water, in series to the outlet of each magnetic valve (see 5.1.10) using flexible tubing.

NOTE 1 To improve the sensitivity of the analytical procedure, 30 ml gas wash bottles can be used optionally

The water volume is chosen to maintain an absolute pressure of (1 100 ± 100) Pa in the test chamber. The pressure in the test chamber is monitored during the entire test period (see 5.1.12).

Place a test piece in the pre-heated test chamber. After closing the test chamber and starting the test, the test piece is uniformly exposed to practically formaldehyde free, heated air (60 ± 0,5) °C with a relative humidity ≤ 3 %. Immediately set the airflow into the chamber to (60 ± 3) l/h, using the needle valve (5.1.5), and the air volume meter (5.1.6). This air is led into one of a series of pairs of gas wash bottles via a magnetic valve (5.1.10).

NOTE 2 Instead of leading dry and clean air through gas wash bottles, dry and clean compressed air can be used optionally.

As the formaldehyde released from the test piece shall be determined at hourly intervals (up to 4 h from starting the test), a new series of gas wash bottles has to be connected every hour. This exchange should be automatic.

Transfer the contents of each pair of gas wash bottles to a 250 ml volumetric flask (see 5.2.5). Rinse the bottles and their associated tubing thoroughly and transfer the rinsings to the flask.

NOTE 3 To improve the sensitivity of the analytical procedure, 100 ml volumetric flasks can be used optionally, possibly in combination with 30 ml gas wash bottles.

Fill to volume with distilled water and determine the formaldehyde content as specified in 7.3.

7.3 Determination of formaldehyde content of the aqueous solutions

7.3.1 General

The formaldehyde content of the aqueous solution from each one hour sampling period shall be determined photometrically.

NOTE A fluorimetric determination can be used optionally.

7.3.2 Principle

The determination is based on the HANTZSCH reaction in which aqueous formaldehyde reacts with ammonium ions and acetylacetone to yield diacetyldihydrolutidine (DDL). DDL has an absorption maximum at 412 nm. The reaction is highly specific to formaldehyde.

NOTE Other suitable photometric procedure may also be used.

7.3.3 Analytical Procedure

10 ml are taken from the aqueous solution (see 7.2) with a pipette (5.2.8) and added to 10 ml acetylacetone solution (4.2) and 10 ml ammonium acetate solution (4.3) in a stoppered flask (5.2.9).

NOTE To improve the sensitivity of the analytical procedure, equal amounts of aqueous solution (see 7.2) and mixed reagent (4.3) can be added optionally considering that the service life of such a mixture is shorter than the service life of the separate solutions.

The flask is stoppered, shaken and heated for 10 min in a water bath (5.2.2) at 60 °C. The heated flask is then cooled in a water bath (5.2.3) operated in a temperature range between 20 °C and 25 °C for at least 15 min protected from sunlight.

The absorbance of this solution is determined at a wavelength of 412 nm against distilled water using a spectrophotometer (5.2.2). A blank value is determined in parallel with distilled water and taken into consideration in the determination of the gas analysis value.