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Indoor air —

Part 24: Performance test for evaluating the reduction of volatile organic compound concentrations by sorptive building materials

Air intérieur —

Partie 24: Essai de performance pour l'évaluation de la réduction des concentrations en composés organiques volatils par des matériaux de construction sorptifs

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 6, *Indoor air*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

This second edition cancels and replaces the first edition (ISO 16000-24:2009), which has been technically revised. The main changes compared to the previous edition are as follows.

— The target chemical compounds subject to this document have been changed from "volatile organic compound (except formaldehyde)" to "volatile organic compound" specified in ISO 16000-6.

A list of all parts in the ISO 16000 series can be found on the ISO website.

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Introduction

Sorptive building materials have been marketed in the form of sheet and board products for removing airborne pollutants via physical sorption or chemical reaction.

Harmonized test methods for evaluating sorptive effects are important for comparative assessment of the performance of sorptive building materials that are used for reducing levels of indoor air contaminants.

This document specifies a test method for evaluating the performance of sorptive building materials for reducing indoor air volatile organic compound (VOC) concentrations over time.

The performance of sorptive building materials is evaluated by measuring the area-specific reduction rate and the saturation mass per area and is affected by a number of factors. Specific test conditions are therefore defined in this document.

This document can be applied to most sorptive building materials used indoors and for VOCs (excluding formaldehyde).

This document is based on and is complementary to the test chamber method specified in ISO 16000-9.

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Indoor air —

Part 24: Performance test for evaluating the reduction of volatile organic compound concentrations by sorptive building materials

1 Scope

This document specifies a general laboratory test method for evaluating the reduction in concentration of VOCs by sorptive building materials. This method applies to boards, wallpapers, carpets, paint products, and other building materials. The sorption of those target compound(s), i.e. VOCs, can be brought about by adsorption, absorption and chemisorption. The performance of the material, with respect to its ability to reduce the concentration of VOCs in indoor air, is evaluated by measuring area-specific reduction rate and saturation mass per area. The former directly indicates material performance with respect to VOC reduction at a point in time; the latter relates to the ability to maintain that performance.

This document is based on the test chamber method specified in ISO 16000-9.

NOTE Sampling, transport and storage of materials to be tested, and preparation of test specimens, are described in ISO 16000-11. Air sampling and analytical methods to determine VOCs are described in ISO 16000-6 and ISO 16017-1.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 16000-3, *Indoor air — Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air — Active sampling method*

ISO 16000-6, *Indoor air — Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS or MS-FID*

ISO 16000-9, *Indoor air — Part 9: Determination of the emission of volatile organic compounds from building products and furnishing — Emission test chamber method*

ISO 16000-11, *Indoor air — Part 11: Determination of the emission of volatile organic compounds from building products and furnishing — Sampling, storage of samples and preparation of test specimens*

ISO 16017-1, *Indoor, ambient and workplace air — Sampling and analysis of volatile organic compounds by sorbent tube/thermal desorption/capillary gas chromatography — Part 1: Pumped sampling*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

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— IEC Electropedia: available at https://www.electropedia.org/

3.1
area-specific reduction rate
q_{ads}
mass of *target compound(s)* (3.14) sorbed per time unit per area at the specified elapsed time from the test start

3.2
breakthrough time
t_b
time at which the *target compound* (3.14) concentration in the air eluting from the sample tube reaches 0,5 % of the concentration in the supply air

3.3
degradation coefficient
ratio of the mass of *target compound(s)* (3.14) removed by the initial performance divided by the mass of the same compound(s) lost by deterioration

3.4
elapsed time
t_e
time from the start of test to the start of air sampling

Note 1 to entry: Elapsed time is expressed in hours or days.

3.5
equivalent ventilation rate per area
$q_{V,\,eq}$
increased clean air ventilation rate giving the same reduction in *target compound* (3.14) concentration as the building material

3.6
guideline concentration
corresponding threshold indoor air concentration *for target compound(s)* (3.14) as specified by the WHO or an appropriate national standards body

3.7
half-lifetime
time elapsed from the start of the test until the *target compound* (3.14) concentration reduction performance decreases to one-half of the initial concentration reduction performance

3.8
lifetime
t_{lt}
time period over which the product continues to reduce *target compound* (3.14) concentrations

Note 1 to entry: The lifetime is given in days or years.

Note 2 to entry: The lifetime is estimated from the *area-specific reduction rate* (3.1) and *sorption capacity* (3.12) measured by the sample tube test.

3.9
mass transfer coefficient
k_a
coefficient arising from the concentrations difference between the test specimen and ambient air over its surface

Note 1 to entry: Mass transfer coefficient is expressed in metres per hour.

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3.10
recovery
measured mass of *target compound(s)* (3.14) in the air leaving the test chamber with no sample present conditioned over a given time period divided by the mass of target compound(s) added to the test chamber in the same time period

Note 1 to entry: The recovery is expressed as a percentage and provides information about the performance of the entire method.

3.11
saturation mass per area
ρ_{Aa}
theoretical maximum mass of *target compound(s)* (3.14) that could be removed per area of the sorptive material

Note 1 to entry: Saturation mass per area is expressed in micrograms per square metre. It corresponds to the *total mass per area of sorption* (3.16) at the *half-lifetime* (3.7) , or is extrapolated from the *sorption capacity* (3.12) derived from the test specified in Annex A.

3.12
sorption capacity
w_S
total mass of *target compound(s)* (3.14) sorbed at *breakthrough time* (3.2) per mass of sorbent

Note 1 to entry: Sorption capacity is expressed in micrograms per gram and is measured using the test specified in Annex A.

3.13
supply air concentration
ρ_S
mass concentration of *target compound(s)* (3.14) in the air for supply to the test chamber

3.14
target compound
volatile organic compound in indoor air

3.15
test chamber concentration
concentration of *target compound(s)* (3.14) measured at the outlet of a test chamber, derived by dividing the mass of the target compound(s) sampled at the outlet of the chamber by the volume of sampled air

3.16
total mass per area of sorption
ρ_A
integral over time of *area-specific reduction rate* (3.1) from the start of the test to the specified *elapsed time* (3.4) measured with the test chamber

Note 1 to entry: Total mass per area of sorption is expressed in micrograms per square metre.

3.17
air sampling period
period of time during which air is sampled from the outlet of the test chamber using sampling tubes or other devices

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