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Utomhusluft – Mätning av bioaerosoler – Del 1: Bestämning av mögel med ett filterprovtagningssystem och analys baserad på odling

Ambient air quality – Measurement of bioaerosols – Part 1: Determination of moulds using filter sampling systems and culture-based analyses

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This Technical Specification is not a Swedish Standard. This document contains the English version of CEN/TS 16115-1:2011

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Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about Swedish and foreign standards.

Dokumentet är framtaget av kommittén för Utomhusluft, SIS/TK 423/AG 4.

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TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CEN/TS 16115-1

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English Version

Ambient air quality - Measurement of bioaerosols - Part 1: Determination of moulds using filter sampling systems and culture-based analyses

Qualité de l'air ambiant - Mesurage de bioaérosols - Partie 1: Dosage des moisissures à l'aide de systèmes de prélèvement sur filtres et d'analyses de cultures

Luftbeschaffenheit - Messen von Bioaerosolen - Teil 1: Bestimmung von Schimmelpilzen mittels Probenahme auf Filtern und kulturellem Nachweis

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Contents

Page

Foreword

This document (CEN/TS 16115-1:2011) has been prepared by Technical Committee CEN/TC 264 “Air quality”, the secretariat of which is held by DIN.

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Introduction

Airborne particles of biological origin are called bioaerosols. Depending on the emission source bioaerosols vary in composition; one component of ambient bioaerosols with possible ecological and health relevance can be moulds. Natural and anthropogenic sources for mould spores are widely distributed in the environment. Anthropogenic sources can for example be agriculture and construction activities or waste treatment.

Mould is a common name for filamentous fungi from different taxonomic groups (Zygomycetes, Ascomycetes, Deuteromycetes). They form a mycelium (hyphae) and spores – namely conidiospores (conidia), sporangiospores or ascospores – by which they become visible macroscopically. Most spores are in the size range of 2 µm to 10 µm, some up to 30 µm and only few up to 100 µm. Spores of some mould genera are small and become airborne very easily (e.g., *Aspergillus, Penicillium*) while others are bigger and/or embedded in a slime matrix (e.g., *Stachybotrys, Fusarium*) and less mobile.

The procedure described in this document is based on VDI 4252 Part 2 [1], VDI 4253 Part 2 [2] and is related to the ISO standards on indoor air ISO 16000-16 [3] and ISO 16000-17 [4].

1 Scope

This Technical Specification describes the measurement of moulds in ambient air in order to identify, quantify and characterize bioaerosol pollution in ambient air resulting from emissions from different sources.

The method described specifies the sampling of moulds as part of the suspended particulate matter (SPM, here particles with aerodynamic diameter up to ca. 30 µm) using a filter sampling system with gelatine/poly-carbonate filter combination followed by the culture-based analyses on DG18 agar. The sampling duration can be varied between 10 min to 24 h. The health effect of bioaerosols is not limited to any particle fraction, therefore, this document describes the sampling of moulds as part of the suspended particulate matter as a convention method.

NOTE The sampling method described in this document in principle is likely to be appropriate for the sampling of actinomycetes and other spore-forming bacteria (resistant to desiccation). For these species a special analytical procedure using different culture media should be applied, but this is not within the scope of this document.

The standard method set out in this Technical Specification is accepted by convention as reference method. The measured quantity, here the number of colony forming units per cubic meter (CFU/m^3), is determined by the inlet design of the sampling head, the associated operational parameters and the analytical procedure.

Standardized methods for sampling, detection and enumeration of moulds including standards for sampling strategies are important for comparative assessment of moulds in ambient air. Before doing any measurements a plan for the measurement strategy is necessary (see CEN/TS 16115-2 [5]).

WARNING — The use of this Technical Specification may involve hazardous materials, operations and equipment. This Technical Specification does not purport to address all the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

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 ISO 8199:2007*, Water quality — General guidance on the enumeration of micro-organisms by culture (ISO 8199:2005)*

3 Terms and definitions

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

3.1
aerodynamic diameter
diameter of a sphere of density 1 g/cm³ with the same terminal velocity due to gravitational force in calm air as the particle, under the prevailing conditions of temperature, pressure and relative humidity

[ISO 7708:1995, 2.2 [6]]

3.2
ambient air
outdoor air in the lower troposphere excluding workplace air

[EN 14907:2005, 3.1.1 [7]]

3.3
analytical blank value
value determined by a blank sample covering the analytical procedure to ensure that no significant contamination occurs during the complete analytical procedure including autoclaving, agar preparation, suspension and extraction of the filters, dilution, incubation, counting, etc.

3.4
bioaerosol
airborne particles of biological origin

[EN 13098:2000, 3.3 [8]].

NOTE Bioaerosols in the sense of this document are all aggregations of particles in the atmosphere to which fungi (spores, conidia, fragments of hyphae), bacteria, viruses and/or pollen as well as their cell membrane components and metabolites (e.g. endotoxins, mycotoxins) are attached or that consist of the above mentioned components.

3.5
biological sampling efficiency
biological preservation efficiency
capacity of the sampler to maintain the viability of the airborne microorganisms during collection and also to keep the microbial products intact

[EN 13098:2000, 3.4 [8]]

NOTE The biological sampling efficiency considers the sampling stress occurring during sampling and analysis in addition to the physical sampling efficiency. It refers to the proportion (in percent) of collected organisms which have not lost the ability to be cultured subsequently. It is strain- and species specific.

3.6
colony count
number of all visible colonies of microorganisms on a culture medium after incubation under the selected conditions

3.7
Colony Forming Unit
CFU
unit by which the culturable number of microorganisms is expressed

[EN 13098:2000, 3.5 [8]].

NOTE 1 One Colony Forming Unit can originate from one single microorganism, an aggregate of many microorganisms or from one or many microorganisms attached to one particle.

NOTE 2 The number of outgrowing colonies depends on cultivation conditions.

3.8
culture-based analyses
cultivation
growing of microorganisms on culture media

[ISO 16000-16:2008, 3.6 [3]]

NOTE The prerequisites for the detection are the abilities to grow and propagate.

3.9
face velocity
air flow rate divided by the face area

NOTE 1 The face velocity is expressed in metres per second.

[Adapted from EN 779:2002, 3.11 [9]]

NOTE 2 In this document, the face velocity is defined as the volume flow rate divided by the effective filter area.

3.10
field blank value
value determined by a blank sample covering the complete measurement procedure including preparation, sampling, transport and analyses to ensure that no significant contamination has occurred during all steps of measurement and to check that the operator can achieve a quantification level adapted to the task

NOTE A field blank sample is a sample taken in an identical manner as the real sample, but without sucking air through the sampling device. The resulting blank represents the number of CFU entering the sample simply by handling the filter during sampling. The results of the field blanks are not used for correction of measurement results but to detect sampling errors.

3.11
filtration
sampling of particles suspended in gas or liquid by flow through a porous medium

[EN 13098:2000, 3.11 [8]]

NOTE In this document, filtration is understood as the separation of moulds from a defined volume of air by means of filters.

3.12
indirect method
suspension of deposited microorganisms with subsequent plating of aliquots on a suitable culture medium, incubation and counting of colonies growing under the conditions selected

[Adapted from ISO 16000-17:2008, 3.3 [4]]

3.13
microbial air pollution
concentrations of airborne microorganisms that exceed natural concentrations or differ in type from the naturally occurring mircoorganisms

3.14
microorganism
microbial entity, either cellular or non cellular, that is capable of multiplication or transfer of genetic material, or entities that have lost these properties

[EN 13098:2000, 3.16 [8]]

3.15
mould
filamentous fungi from several taxonomic groups namely Zygomycetes, Ascomycetes (Ascomycota) and Deuteromycetes (fungi imperfecti)

NOTE Moulds form different types of spores depending on the taxonomic group they belong to, namely conidiospores (conidia), sporangiospores or ascospores.

[ISO 16000-16:2008, 3.9 [3]]

3.16
physical sampling efficiency
capacity of the sampling device to collect particles with specific sizes suspended in ambient air

[Adapted from EN 13098:2000, 3.17 [8]]