SLOVENSKI STANDARD
oSIST ISO/DIS 19087:2017

01-september-2017

Zrak na delovnem mestu - Analiza respirabilnega kristaliničnega kremena s spektroskopijo FTIR

Workplace air - Analysis of respirable crystalline silica by Fourier-Transform Infrared spectroscopy

Air des lieux de travail - Mesure de la fraction alvéolaire de la silice cristalline par spectrométrie infrarouge

iTeh Standards
(https://standards.iteh.ai)
Document Preview

Ta slovenski standard je istoveten z: **ISO/DIS 19087**

SIST ISO 19087:2019
https://standards.iteh.ai/catalog/standards/sist/40add5ab-0421-44d5-b50b-297108a6e2bb/sist-iso-19087-2019

ICS:

13.040.30	Kakovost zraka na delovnem mestu	Workplace atmospheres

oSIST ISO/DIS 19087:2017 **en**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

iTeh Standards
(https://standards.iteh.ai)
Document Preview

SIST ISO 19087:2019
https://standards.iteh.ai/catalog/standards/sist/40add5ab-0421-44d5-b50b-297108a6e2bb/sist-iso-19087-2019

oSIST ISO/DIS 19087:2017

DRAFT INTERNATIONAL STANDARD

ISO/DIS 19087

ISO/TC **146**/SC **2**

Secretariat: **ANSI**

Voting begins on:
2016-08-22

Voting terminates on:
2016-11-13

Workplace air — Analysis of respirable crystalline silica by Fourier-Transform Infrared spectroscopy

Air des lieux de travail — Mesure de la fraction alvéolaire de la silice cristalline par spectrométrie infrarouge

ICS: 13.040.30

iTeh Standards
(https://standards.iteh.ai)
Document Preview

SIST ISO 19087:2019
https://standards.iteh.ai/catalog/standards/sist/40add5ab-0421-44d5-b50b-297108a6e2bb/sist-iso-19087-2019

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

This document is circulated as received from the committee secretariat.

Reference number
ISO/DIS 19087:2016(E)

© ISO 2016

oSIST ISO/DIS 19087:2017

iTeh Standards
(https://standards.iteh.ai)
Document Preview

SIST ISO 19087:2019
https://standards.iteh.ai/catalog/standards/sist/40add5ab-0421-44d5-b50b-297108a6e2bb/sist-iso-19087-2019

COPYRIGHT PROTECTED DOCUMENT

© ISO 2016, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

 © ISO 2016 – All rights reserved

oSIST ISO/DIS 19087:2017

Contents

Page

iTeh Standards
(https://standards.iteh.ai)
Document Preview
ISO/DIS 19087:2016
https://standards.iteh.ai/catalog/standards/sist/...-19087-2016

© ISO 2016 – All rights reserved

oSIST ISO/DIS 19087:2017

iTeh Standards
(https://standards.iteh.ai)
Document Preview
SIST ISO 19087:2019
https://standards.iteh.ai/catalog/standards/sist/40add5ab-0421-44d5-b50b-297108a6e2bb/sist-iso-19087-2019

© ISO 2016 – All rights reserved

oSIST ISO/DIS 19087:2017

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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

ISO 19087 was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 2, *Workplace air*.

iTeh Standards
(https://standards.iteh.ai)
Document Preview
SIST ISO 19087:2019
https://standards.iteh.ai/catalog/standards/sist/40add5ab-0421-44d5-b50b-297108a6e2bb/sist-iso-19087-2019

© ISO 2016 – All rights reserved

oSIST ISO/DIS 19087:2017

Introduction

Respirable crystalline silica (RCS) is a hazard to the health of workers in many industries through exposure by inhalation. Industrial hygienists and other public health professionals need to determine the effectiveness of measures taken to control workers' exposure. The collection of samples of air during a work activity and then measuring the amount of respirable crystalline silica are often done to assess an individual's exposure, the effectiveness of controls or their respiratory protection. Fourier-Transform Infrared (FTIR) analysis of crystalline silica in a sample of respirable dust collected on a collection substrate is employed in many countries to measure and estimate exposure to RCS. FTIR is able to identify quartz and cristobalite.

ISO 19087 specifies the analysis procedures for the measurement of RCS through three methods:

a) Direct-on-filter method: a method of analysing RCS directly on the air sample filter. A specific requirement of this method is that the sampler used for the workplace measurements are the same for the preparation of calibration samples.

b) Indirect method by redeposition: a method where the dust is recovered from the collection substrate and deposited onto a filter for analysis.

c) Indirect method by potassium bromide (KBr) pellet: a method where the dust is recovered from the collection substrate and pressed into a potassium bromide (KBr) pellet for analysis.

Many different types of sampling apparatus are used to collect respirable dust, according to the occupational hygiene convention. ISO 19087 is designed to accommodate the variety of samplers and collection substrates available to analysts. ISO 19087 is to be used in conjunction with ISO 24095 which promotes best practice for these analyses.

iTeh Standards
(https://standards.iteh.ai)
Document Preview

SIST ISO 19087:2019
https://standards.iteh.ai/catalog/standards/sist/40add5ab-0421-44d5-b50b-297108a6e2bb/sist-iso-19087-2019

 © ISO 2016 – All rights reserved

oSIST ISO/DIS 19087:2017

Workplace air — Analysis of respirable crystalline silica by Fourier-Transform Infrared spectroscopy

1 Scope

ISO 19087 is a standard for the analysis of respirable crystalline silica (RCS) in samples of air collected on collection substrates (i.e. filters or foams) by Fourier-Transform Infrared (FTIR). There are three analytical approaches. The dust from the sample collection substrate is:

a) analysed directly on sampled filter; or

b) recovered, treated and deposited onto another filter for analysis; or

c) recovered, treated and pressed into a potassium bromide (KBr) pellet for analysis by the instrument.

ISO 19087 will include information on the instrumental parameters, sensitivity of different sampling apparatus, the use of different filters and sample treatment to remove interference. In ISO 19087 the expression respirable crystalline silica (RCS) includes the most common polymorphs quartz and cristobalite. The less common polymorphs of crystalline silica, such as tridymite, are not included within the scope of this part of ISO 19087 because a standard reference material is not available. Under certain circumstances (i.e. low filter dust loads, low silica content), the analytical approach described in this method may not fulfil the expanded uncertainty requirements of ISO/DIS 20581[6]. Guidance for calculation of uncertainty for measurements of RCS is given in ISO 24095.

iTeh Standards
(https://standards.iteh.ai)
Document Preview

2 Normative reference

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

SIST ISO 19087:2019
https://standards.iteh.ai/catalog/standards/sist/40ad45cb-0421-44d5-b50b-297108c6c2bb/sist-iso-19087-2019

ISO 7708, *Air quality — Particle size fraction definitions for health-related sampling*

ISO 13137, *Workplace atmospheres — Pumps for personal sampling of chemical and biological agents — Requirements and test methods*

ISO 15767, *Workplace atmospheres — Controlling and characterizing uncertainty in weighing collected aerosols*

ISO 18158, *Workplace air — Terminology*

ISO 24095, *Workplace air — Guidance for the measurement of respirable crystalline silica*

3 Terms and definitions

For the purposes of this document, the terms and definitions of ISO 18158 apply in addition to those listed below.

© ISO 2016 – All rights reserved

oSIST ISO/DIS 19087:2017

3.1 General definitions

3.1.1
respirable crystalline silica
RCS
inhaled particles of crystalline silica that penetrate into the unciliated airways according to the respirable convention described in ISO 7708

3.1.2
exposure (by inhalation)
situation in which a chemical or biological agent is present in air that is inhaled by a person.

3.2 Sampling definitions

3.2.1
analysis filter
a suitable filter used to carry out the RCS analysis

For direct-on-filter FTIR analysis the collection substrate is the analysis filter.

For the indirect analysis the dust is removed from the collection substrate and redeposited onto an analysis filter

3.2.2
collection substrate
medium on which airborne chemical and/or biological agents are collected for subsequent analysis

For the purpose of ISO 19087 filters, polyurethane foams, and sampling cassettes are examples of collection substrates for airborne particles. Impinger solutions are not applicable.

iTeh Standards
(https://standards.iteh.ai)
Document Preview

3.2.3
field blank
unused collection substrate, taken from the same batch used for sampling, handled in the same way as a collection substrate that is used for sampling, but not used for sample collection

Adapted from EN 14902:2005A field blank is transported to the sampling site, loaded in the sampler, where applicable, and returned to the laboratory in the same way as a sample.

SIST ISO 19087:2019
https://standards.iteh.ai/catalog/standards/sist/40add5a8-0421-44d5-b908-297108a6e2bb/sist-iso-19087-2019

The results from the analysis of field blanks are used to identify contamination of the sample arising from handling in the field and during transport.

3.2.4
laboratory blank
unused collection substrate, typically taken from the same batch used for sampling, that is not transported to the field, but undergoes the same handling as the sample substrate in the laboratory, including conditioning and placing into the samplers or transport containers when this is done in the laboratory

The results from the analysis of laboratory blanks are used to correct for background absorption.

3.3 Analytical definitions

3.3.1
limit of detection
detection limit
LOD
lowest amount of an analyte that is detectable with a given level of confidence

 © ISO 2016 – All rights reserved

oSIST ISO/DIS 19087:2017

The limit of detection can be calculated as three times the standard deviation of blank measurements. This represents a probability of 50 % that the analyte will not be detected when it is present at the concentration of the LOD.

The LOD can be used as a threshold value to assert the presence of a substance with a known confidence.

Many analysis procedures require laboratories to calculate an LOD by multiplying the standard deviation of measurements of a number of blank samples (~10) by three. Readers should note that there is some doubt about the relationship between signal and the mass when RCS is measured at very low masses and a specific formula to determine the LOD using statistics based on a normal distribution is not given in this guidance. The test samples used for calibration are not matrix matched and reporting an LOD based on three standard deviations of the background noise may give an optimistic impression of the capability of method when analysing 'real' samples. Analysts should take this into consideration when analysing samples for RCS (ISO 24095).

4 Principle

ISO 19087 provides three Fourier-Transform Infrared (FTIR) analytical approaches for the analysis of RCS in respirable dust collected on a sample collection substrate.

a) Direct-on-filter method:

   The respirable dust on the collection substrate (usually 25 mm diameter filter) is measured without transferring the dust to an analysis filter. The mass of RCS is determined from the FTIR response, calibrated against filters loaded with known amounts of RCS reference material.

b) Indirect method (redeposition):

   The dust from the sample collection substrate (i.e. 37 mm diameter filter or a polyurethane foam) is recovered, treated and deposited on another analysis filter (usually 25 mm diameter or smaller) for analysis by the instrument. The instrument is calibrated by preparing test samples from aliquots of a suspension of standard dust. The mass of RCS is determined from the FTIR response, calibrated against analysis filters loaded with known amounts of RCS reference material.

c) Indirect method (KBr pellet):

   The dust from the sample collection substrate (i.e. 37 mm diameter filter or a polyurethane foam) is recovered, treated and pressed into a KBr pellet for analysis by the instrument. The instrument is calibrated by preparing KBr pellets with known amounts of standard dust. The mass of RCS is determined from the FTIR response, calibrated against pellets loaded with known amounts of RCS reference material.

Since the volume of air sampled is known the concentration of RCS in the air is readily calculated. Because the different aerosol samplers for respirable dust deposit the sample over the surface of the filter in different ways, the FTIR instruments used for the direct-on-filter analysis approach shall be calibrated for the aerosol sampler used to collect the samples.

The suitability of FTIR to determine the RCS concentration in a workplace sample depends on the composition of the dust and potential interferences. If the FTIR method to subtract a reference spectrum from the sample spectrum (refer to 7.2.7) does not lead to a satisfactory baseline profile then the FTIR method is not suitable for the matrix and the XRD analytical method should be used (refer to Section 8). Qualitative X-ray diffraction (XRD) analysis can be carried out prior to FTIR analysis to obtain information about the sample.

iTeh Standards
(https://standards.iteh.ai)
Document Preview
SIST ISO 19087:2019

© ISO 2016 – All rights reserved