SLOVENSKI STANDARD
oSIST prEN 17289-3:2019

01-februar-2019

[Not translated]

Characterization of bulk materials - Determination of a sizeweighted fine fraction and crystalline silica content - Part 3: Calculation method

Charakterisierung von Schüttgütern - Bestimmung einer größengewichteten Feinfraktion und des Anteils an kristallinem Quarz - Teil 3: Berechnungsverfahren

Ta slovenski standard je istoveten z: **prEN 17289-3**

ICS:

13.040.30	Kakovost zraka na delovnem mestu	Workplace atmospheres

oSIST prEN 17289-3:2019 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 17289-3

January 2019

ICS 13.040.30

English Version

Characterization of bulk materials - Determination of a sizeweighted fine fraction and crystalline silica content - Part 3: Calculation method

Charakterisierung von Schüttgütern - Bestimmung einer größengewichteten Feinfraktion und des Anteils an kristallinem Quarz - Teil 3: Berechnungsverfahren

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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.

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European foreword

This document (prEN 17289-3:2019) has been prepared by Technical Committee CEN/TC 137 “Assessment of workplace exposure to chemical and biological agents”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

Introduction

A method was developed in the industrial minerals industry for the purpose of determining the "size weighted relevant fine fraction" within the bulk material. This method provides the necessary information to the users and allows them to compare bulk materials, by measuring the fine fraction, in order for them to select the safest materials. It has been used in the industry and by institutes previously under the acronym SWeRF. EN 17289 (all parts) is based on that industrial method and describes the analytical methods to determine the difference between materials with coarse quartz and fine quartz, e.g. sands versus flour.

As further activities with the material (intentional or otherwise) might change the particle size distribution, the size weighted fine fraction might also change. Therefore, the method reports (in terms of the mass percentages in the bulk material) both, the total CS and the estimated size weighted fine fraction of CS.

Conventions as described in EN 481 can be used as input for this document. However, the output of this document is not related to the respirable fraction and cannot be used for workplace exposure measurements.

EN 17289 (all parts) describes two procedures that can be used to estimate the size weighted fine fraction (SWFF) in bulk materials. It also describes how the SWFF, once separated, can be further analysed to measure the content of crystalline silica ($SWFF_{cs}$). The method can be used for comparing the fine fraction in different bulk samples. EN 17289 (all parts) uses the term fine fraction to indicate that it does not analyse airborne particles, but it evaluates the proportion of particles in a bulk material that, based on their particle size, have a potential to be respirable if they were to become airborne.

EN 17289 (all parts) also allows for the size weighted fine fraction of crystalline silica ($SWFF_{cs}$) particles in bulk materials to be evaluated in terms of mass fraction in percent, if the fraction separated is subsequently analysed by a suitable method.

In a comparison of similar bulk materials, in which the particle size distribution is the only variable, the SWFF can provide useful information to guide material selection. For example, leaving all other factors aside, a bulk material with a lower SWFF value can pose less of a risk in terms of potential occupational exposure. For the actual exposure at the workplace, the handling etc of the material, will play a major role.

Concentrations of respirable dust, or respirable crystalline silica (RCS), in the workplace air, resulting from processing and handling of bulk materials, will depend on a wide variety of factors and these concentrations cannot be estimated using SWFF or $SWFF_{cs}$ values. SWFF and $SWFF_{cs}$ values are not to be used for occupational exposure assessments as they have no relationship with occupational exposure.

The evaluation of bulk materials using SWFF is complementary to determining the dustiness according to EN 15051-1 [1].

The difference between EN 17289 (all parts) and EN 15051-1 is that SWFF quantifies the fine fraction in a bulk material while dustiness quantifies the respirable, thoracic and inhalable dust made airborne from the bulk material after a specific activity (it characterizes the material with relation to the workplace atmosphere when working with the bulk material).

EN 17289 *Characterization of bulk materials — Determination of a size-weighted fine fraction and crystalline silica content* consists of the following parts:

— Part 1: *General information and choice of test methods*;

— Part 2: *Calculation method*;

— Part 3: *Sedimentation method*.

Part 1 gives information on how to choose the most appropriate method as well as a guideline for the determination of crystalline silica. A calculation method based on particle size distribution is described in Part 2. Part 3 describes a method using sedimentation.

1 Scope

This document specifies the determination of the size weighted fine fraction (SWFF) and the size weighted fine fraction of crystalline silica ($SWFF_{CS}$) in bulk materials by means of a sedimentation method using a liquid sedimentation technique.

The purpose of this document is to allow users to evaluate bulk materials with regard to their size-weighted fine fraction and crystalline silica content.

For preparation of the sample and determination of crystalline silica by XRD and FT-IR see prEN 17289-1:2018.

Annex A to Annex E describe specific methods for the evaluation of SWFF for specific bulk materials.

This document is applicable for bulk materials which have been fully investigated and validated. The criteria for the materials are described in this document and prEN 17289-2:2018. This includes industrial minerals which can contain crystalline silica such as quartz, clay, kaolin, talc, feldspar, mica, cristobalite, vermiculite, diatomaceous earth, barite, andalusite, iron ore, chromite etc.

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..

EN 1540, *Workplace exposure - Terminology*

EN 481, *Workplace atmospheres - Size fraction definitions for measurement of airborne particles*

prEN 17289-1:2019, *Characterization of bulk materials – Determination of a size-weighted fine fraction and crystalline silica content — Part 1: General information and choice of test methods*

prEN 17289-2:2019, *Characterization of bulk materials – Determination of a size-weighted fine fraction and crystalline silica content — Part 2: Calculation method*

3 Terms and definitions

For the purposes of this document, tthe terms and definitions given in in EN 1540 and prEN17289-1:2019 apply.

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

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

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

4 Symbols and abbreviations

CS	Crystalline Silica
PSD	Particle Size Distribution
PSCD	Particle Size Cumulative Distribution
SWFF	Size Weighted Fine Fraction
$SWFF_{CS}$	Size Weighted Fine Fraction of crystalline silica

5 Assumptions

The sedimentation method is based on the following assumptions:

a) All liquid that is extracted from the sedimentation vessel only comes from the space above the extraction nozzle, and not from the space below the extraction nozzle. If this is not the case this will result in a higher SWFF.

b) The particle size distribution of the bulk material is constant over the particle size range of interest, i.e. from 1 µm to 12 µm (aerodynamic).

A constant particle size distribution is a PSD with a function that has a derivative which is constant, see Formula (1).

$$PSD(D) = \frac{(D - B)}{(A - B)} \times 100 \quad (1)$$

where

D is the particle size;

B is the minimum particle size;

A is the maximum particle size;

NOTE $B \leq D \leq A$. See Figure 1 for an example.

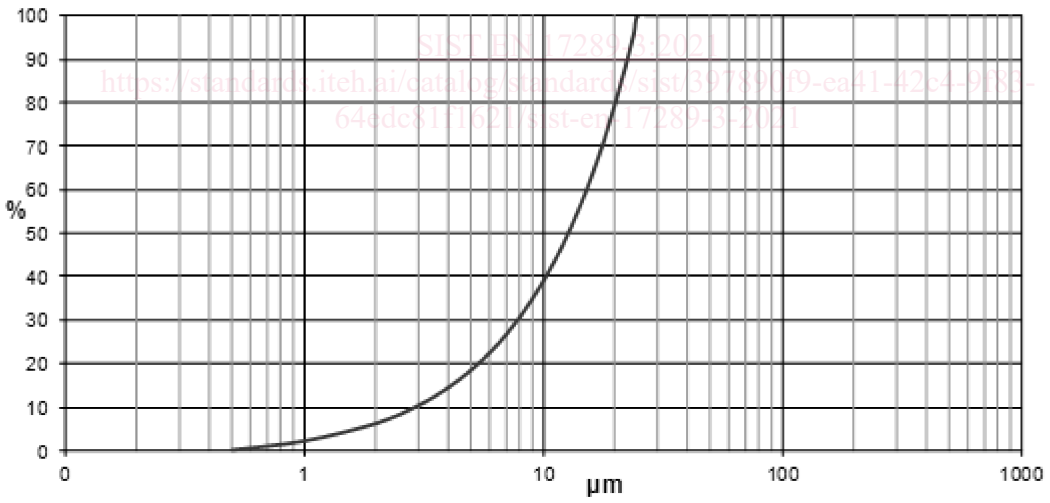

Figure 1 — Example of a constant PSCD with A = 25 µm and B = 0,5 µm

c) The particle size distribution of the sample does not have a mean diameter (D_{50}) in the range from 6 µm and 12 µm (aerodynamic), and has a too narrow distribution. The distribution is considered too narrow when the relative span of the distribution is less than 1,5. Relative span is calculated as $((D_{90}-D_{10})/D_{50})$. In case the sample has a narrow size distribution SWFF and $SWFF_{CS}$ should be calculated from the particle size distribution.