BS ISO 17091:2013

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Workplace air — Determination of lithium hydroxide, sodium hydroxide, potassium hydroxide and calcium dihydroxide — Method by measurement of corresponding cations by suppressed ion chromatography

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The UK participation in its preparation was entrusted to Technical Committee EH/2/2, Work place atmospheres.

A list of organizations represented on this committee can be obtained on request to its secretary.

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INTERNATIONAL STANDARD

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Workplace air — Determination of lithium hydroxide, sodium hydroxide, potassium hydroxide and calcium dihydroxide — Method by measurement of corresponding cations by suppressed ion chromatography

Air des lieux de travail — Détermination de la teneur en hydroxyde de lithium, hydroxyde de sodium, hydroxyde de potassium et dihydroxyde de calcium — Méthode par mesurage des cations correspondants par chromatographie ionique

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Foreword

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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).

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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

The committee responsible for this document is ISO/TC 146, *Air quality,* Subcommittee SC 2, *Workplace atmospheres*.

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Introduction

The health of workers in many industries is at risk through exposure by inhalation of lithium hydroxide, sodium hydroxide, potassium hydroxide, and calcium dihydroxide. Industrial hygienists and other public health professionals need to determine the effectiveness of measures taken to control workers' exposure, and this is generally achieved by making workplace air measurements. This International Standard has been published in order to make available a method for making valid exposure measurements for lithium hydroxide, sodium hydroxide, potassium hydroxide, and calcium dihydroxide in use in industry. It will be of benefit to: agencies concerned with health and safety at work; industrial hygienists and other public health professionals; analytical laboratories; industrial users of lithium hydroxide, sodium hydroxide, potassium hydroxide, and calcium dihydroxide and their workers; etc.

It has been assumed in the drafting of this International Standard that the execution of its provisions and the interpretation of the results obtained are entrusted to appropriately qualified and experienced people.

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INTERNATIONAL STANDARD ISO 17091:2013(E)

Workplace air — Determination of lithium hydroxide, sodium hydroxide, potassium hydroxide and calcium dihydroxide — Method by measurement of corresponding cations by suppressed ion chromatography

1 Scope

This International Standard specifies a method for the determination of the time-weighted average mass concentration of lithium hydroxide (LiOH), sodium hydroxide (NaOH), potassium hydroxide (KOH), and calcium dihydroxide [$Ca(OH)_2$] in workplace air by collection of the particulate hydroxides on a filter and analysis of the corresponding cations using ion chromatography.

For aerosol sampling, the method is applicable to the personal sampling of the inhalable fraction of airborne particles, as defined in ISO 7708, and to static (area) sampling.

The method is applicable to the determination of masses of 0,005 mg to at least 2,5 mg of lithium per sample and 0,01 mg to at least 5 mg of sodium, potassium, and calcium per sample.

The concentration range of particulate LiOH, NaOH, KOH, and $Ca(OH)_2$ in air for which the measuring procedure is applicable is determined by the sampling method selected by the user. For a 1 m^3 air sample, the working range is approximately 0,002 mg m^{-3} to at least 20 mg m^{-3} for all four hydroxides. For a 30 l air sample, the lower limit of the working range is approximately 0,1 mg m^{-3} for all four hydroxides.

The procedure does not allow differentiation between the hydroxides and their corresponding salts if both are present in the air. If the cations are present alone in the form of hydroxides, the method is specific for these basic compounds. In other circumstances, the results obtained represent the highest concentration of the hydroxides that could be present in the sampled air. (See 12.6.)

2 Normative references

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.

ISO 1042, *Laboratory glassware — One-mark volumetric flasks*

ISO 7708:1995, *Air quality — Particle size fraction definitions for health-related sampling*

ISO 8655-1, *Piston-operated volumetric apparatus — Part 1: Terminology, general requirements and user recommendations*

ISO 8655-2, *Piston-operated volumetric apparatus — Part 2: Piston pipettes*

ISO 8655-6, *Piston-operated volumetric apparatus — Part 6: Gravimetric methods for the determination of measurement error*

ISO 13137:—[1)], *Workplace atmospheres — Pumps for personal sampling of chemical and biological agents — Requirements and test methods*

EN 13205-1, *Workplace atmospheres — Assessment of performance of instruments for measurement of airborne particle concentrations — Part 1: General requirements*

1) To be published.

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3 Terms and definitions

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

3.1 General definitions

3.1.1
breathing zone
<general definition> space around the worker's face from which breath is taken

[SOURCE: EN 1540:2011, 2.4.5, modified]

3.1.2
breathing zone
<technical definition> hemisphere (generally accepted to be 0,3 m in radius) extending in front of the human face, centred on the midpoint of a line joining the ears; the base of the hemisphere is a plane through this line, the top of the head, and the larynx

Note 1 to entry: The definition is not applicable when respiratory protective equipment is used.

[SOURCE: EN 1540:2011, 2.4.5, modified]

3.1.3
chemical agent
any chemical element or compound, on its own or admixed, as it occurs in the natural state or as produced, used, or released, including release as waste, by any work activity, whether or not produced intentionally and whether or not placed on the market

[SOURCE: Council Directive 98/24/EC, Art. 2(a)]

3.1.4
exposure (by inhalation)
situation in which a chemical agent is present in the air that is inhaled by a person

[SOURCE: EN 1540:2011, 2.4.1, modified]

3.1.5
occupational exposure limit value
limit value
limit of the time-weighted average of the concentration of a chemical agent in the air within the breathing zone of a worker in relation to a specified reference period

[SOURCE: Council Directive 98/24/EC, Art. 2(d)]

EXAMPLE Threshold limit values® (TLVs) established by the ACGIH,[15] indicative occupational exposure limit values (IOELVs) promulgated by the European Commission,[16] and national limit values. Information on national limit values is available from the International Labour Organization (ILO)[17] and on the GESTIS database.[18]

3.1.6
measuring procedure
measurement procedure
set of operations, described specifically, used for the sampling and analysis of chemical agents in air

Note 1 to entry: A measuring procedure for the sampling and analysis of chemical agents in air usually includes the following steps: preparation for sampling, sampling, transportation and storage, preparation of samples for analysis, and analysis.

[SOURCE: ISO/IEC Guide 99:2007, modified]

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3.1.7
operating time
period during which the pump can be operated at a specified flow rate and pressure drop without recharging or replacing the battery

[SOURCE: ISO 13137:—, 3.12]

3.1.8
reference period
specified period of time for which the occupational exposure limit value of a chemical agent applies

Note 1 to entry: The reference period is usually 8 h for long-term measurements and 15 min for short-term measurements.

Note 2 to entry: Examples for different reference periods are short-term and long-term limit values, such as those established by the ACGIH.[15]

[SOURCE: EN 1540:2011, 2.4.7, modified]

3.1.9
workplace
designated area or areas in which the work activities are carried out

[SOURCE: EN 1540:2011, 2.5.2]

3.2 Particle size fraction definitions

3.2.1
inhalable convention
target specification for sampling instruments when the inhalable fraction is of interest

[SOURCE: ISO 7708:1995]

3.2.2
inhalable fraction
mass fraction of total airborne particles which is inhaled through the nose and mouth

Note 1 to entry: The inhalable fraction depends on the speed and direction of air movement, on breathing rate, and other factors.

[SOURCE: ISO 7708:1995]

3.2.3
total airborne particles
all particles surrounded by air in a given volume of air

Note 1 to entry: Because all measuring instruments are size-selective to some extent, it is often impossible to measure the total airborne particles concentration.

[SOURCE: ISO 7708:1995]

3.3 Sampling definitions

3.3.1
air sampler
device for separating chemical agents from the surrounding air

Note 1 to entry: Air samplers are generally designed for a particular purpose, e.g. for sampling gases and vapours or for sampling airborne particles.

[SOURCE: EN 1540:2011, 3.2.1, modified]

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3.3.2
personal sampler
sampler, attached to a person, that collects gases, vapours, or airborne particles in the breathing zone to determine exposure to chemical agents

[SOURCE: EN 1540:2011, 3.2.2]

3.3.3
personal sampling
process of sampling carried out using a personal sampler

[SOURCE: EN 1540:2011, 3.3.3]

3.3.4
static sampler
area sampler
sampler, not attached to a person, that collects gases, vapours, or airborne particles at a particular location

[SOURCE: EN 1540:2011, 3.2.3]

3.3.5
static sampling
area sampling
process of air sampling carried out in a particular location

[SOURCE: EN 1540:2011, 3.3.4]

3.4 Analytical definitions

3.4.1
analysis
all operations carried out after sample preparation to determine the amount or concentration of the analyte(s) of interest present in the sample

[SOURCE: EN 14902:2005, 3.1.1, modified]

3.4.2
blank solution
solution prepared by taking a reagent blank, laboratory blank, or field blank through the same procedure used for sample dissolution

3.4.3
calibration blank solution
calibration solution prepared without the addition of any working standard solution

Note 1 to entry: The concentrations of Li, Na, K and Ca in the calibration blank solution are taken to be zero.

[SOURCE: EN 14902:2005, 3.1.3, modified]

3.4.4
calibration solution
solution prepared by dilution of the working standard solution, containing Li, Na, K, and Ca at concentrations that are suitable for use in calibration of the analytical instrument

[SOURCE: EN 14902:2005, 3.1.3, modified]

3.4.5
field blank
filter that is taken through the same handling procedure as a sample, except that it is not used for sampling, i.e. it is loaded into a sampler, transported to the sampling site, and then returned to the laboratory for analysis

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