SLOVENSKI STANDARD
oSIST prEN 17195:2022

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Gradbeni proizvodi - Ocenjevanje sproščanja nevarnih snovi - Analiza anorganskih snovi v izlužkih

Construction products: Assessment of release of dangerous substances - Analysis of inorganic substances in eluates

Bauprodukte: Bewertung der Freisetzung von gefährlichen Stoffen - Analyse von anorganischen Stoffen in Eluaten

Produits de construction - Évaluation du relargage de substances dangereuses - Analyse des substances inorganiques dans les éluats

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13.020.99	Drugi standardi v zvezi z varstvom okolja	Other standards related to environmental protection
91.100.01	Gradbeni materiali na splošno	Construction materials in general

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Construction products: Assessment of release of dangerous substances - Analysis of inorganic substances in eluates

Produits de construction - Évaluation du relargage de substances dangereuses - Analyse des substances inorganiques dans les éluats

Bauprodukte: Bewertung der Freisetzung von gefährlichen Stoffen - Analyse von anorganischen Stoffen in Eluaten

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 17195:2022) has been prepared by Technical Committee CEN/TC 351 “Construction products - Assessment of release of dangerous substances”, the secretariat of which is held by NEN.

This document is currently submitted to the CEN Enquiry.

This document will supersede CEN/TS 17195:2018.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association.

Introduction

Following an extended evaluation of available methods for content analysis in construction products (CEN/TR 16045, [1]) it was concluded that eluate analysis methods are very similar to analytical methods used to determine content after digestion of a solid matrix.

This document has been adopted from the work carried out in the context of CEN/TC 292 and is very similar to EN 16192 [2].

This document is part of a modular horizontal approach which was adopted in CEN/TC 351. “Horizontal” means that the methods can be used for a wide range of materials and products with certain properties. “Modular” means that a test standard developed in this approach concerns a specific step in assessing a property and not the whole chain of measurement (from sampling to analyses). Beneficial features of this approach are that modules can be replaced by better ones without jeopardizing the standard chain and duplication of work of in different Technical Committees for Products can be avoided as far as possible.

The modules that relate to the standards developed in CEN/TC 351 are specified in CEN/TR 16220 [3], which distinguishes between the modules. This document belongs to the analytical step.

The use of modular horizontal standards implies the drawing of test schemes as well. Before executing a test on a certain construction product to determine certain characteristics, it is necessary to draw up a protocol in which the adequate modules are selected and together form the basis for the entire test procedure.

1 Scope

This document specifies analytical methods for the determination of major, minor and trace elements and of anions in aqueous eluates from construction products. It refers to the following 67 elements:

Aluminium (Al), antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), bismuth (Bi), boron (B), cadmium (Cd), calcium (Ca), cerium (Ce), caesium (Cs), chromium (Cr), cobalt (Co), copper (Cu), dysprosium (Dy), erbium (Er), europium (Eu), gadolinium (Gd), gallium (Ga), germanium (Ge), gold (Au), hafnium (Hf), holmium (Ho), indium (In), iridium (Ir), iron (Fe), lanthanum (La), lead (Pb), lithium (Li), lutetium (Lu), magnesium (Mg), manganese (Mn), mercury (Hg), molybdenum (Mo), neodymium (Nd), nickel (Ni), palladium (Pd), phosphorus (P), platinum (Pt), potassium (K), praseodymium (Pr), rubidium (Rb), rhenium (Re), rhodium (Rh), ruthenium (Ru), samarium (Sm), scandium (Sc), selenium (Se), silicon (Si), silver (Ag), sodium (Na), strontium (Sr), sulphur (S), tellurium (Te), terbium (Tb), thallium (Tl), thorium (Th), thulium (Tm), tin (Sn), titanium (Ti), tungsten (W), uranium (U), vanadium (V), ytterbium (Yb), yttrium (Y), zinc (Zn), and zirconium (Zr) and to the following four anions: Cl^-, Br^-, F^-, SO_4^{2-}.

This document also describes how to measure general parameters like pH, electrical conductivity, DOC/TOC.

The methods in this document are applicable to construction products.

NOTE Construction products include e.g. mineral-based products (S); bituminous products (B); metals (M); wood-based products (W); plastics and rubbers (P); sealants and adhesives (A); paints and coatings (C), see also CEN/TR 16045.

The selection of analytical methods to be applied is based on the required sensitivity of the method, which is provided for all substance - analytical procedure combinations.

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 1484, *Water analysis — Guidelines for the determination of total organic carbon (TOC) and dissolved organic carbon (DOC)*

EN 16687:2015, *Construction products — Assessment of release of dangerous substances — Terminology*

prEN 17197, *Construction products: Assessment of release of dangerous substances — Analysis of inorganic substances in digests and eluates — Analysis by inductively coupled plasma optical emission spectrometry (ICP-OES)*

prEN 17200, *Construction products: Assessment of release of dangerous substances — Analysis of inorganic substances in digests and eluates — Analysis by inductively coupled plasma mass spectrometry (ICP-MS)*

EN 27888, *Water quality — Determination of electrical conductivity (ISO 7888)*

EN ISO 5667-3, *Water quality — Sampling — Part 3: Preservation and handling of water samples (ISO 5667-3)*

EN ISO 10304-1, *Water quality — Determination of dissolved anions by liquid chromatography of ions — Part 1: Determination of bromide, chloride, fluoride, nitrate, nitrite, phosphate and sulfate (ISO 10304-1)*

EN ISO 10523, *Water quality — Determination of pH (ISO 10523)*

EN ISO 12846, *Water quality — Determination of mercury — Method using atomic absorption spectrometry (AAS) with and without enrichment (ISO 12846)*

EN ISO 15586, *Water quality — Determination of trace elements using atomic absorption spectrometry with graphite furnace (ISO 15586)*

EN ISO 17852, *Water quality — Determination of mercury — Method using atomic fluorescence spectrometry (ISO 17852)*

ISO 10359-1, *Water quality — Determination of fluoride — Part 1: Electrochemical probe method for potable and lightly polluted water*

ISO 17378-1, *Water quality — Determination of arsenic and antimony — Part 1: Method using hydride generation atomic fluorescence spectrometry (HG-AFS)*

ISO 17378-2, *Water quality — Determination of arsenic and antimony — Part 2: Method using hydride generation atomic absorption spectrometry (HG-AAS)*

ISO/TS 17379-1, *Water quality — Determination of selenium — Part 1: Method using hydride generation atomic fluorescence spectrometry (HG-AFS)*

ISO/TS 17379-2, *Water quality — Determination of selenium — Part 2: Method using hydride generation atomic absorption spectrometry (HG-AAS)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16687:2015 and the following 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

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

3.1
eluate
solution obtained from a leaching test

[SOURCE: EN 16687:2015, 4.2.7]

3.2
leachant
liquid that is brought into contact with the test portion in the leaching procedure

Note 1 to entry: Usually demineralized water is used as leachant for laboratory leaching tests.

[SOURCE: EN 16687:2015, 4.2.6]

3.3
leaching test
laboratory test for the determination of the release of substances from a construction product into a leachant

3.4
sample
portion of material selected from a larger quantity of material

Note 1 to entry: The manner of selection of the sample should be described in a sampling plan.

Note 2 to entry: The term "sample" is often accompanied by a prefix (e.g. laboratory sample, test sample) specifying the type of sample and/or the specific step in the sampling process to which the obtained material relates.

[SOURCE: EN 16687:2015, 3.1.5]

3.5
laboratory sample
sample or subsample(s) sent to or received by the laboratory

Note 1 to entry: When the laboratory sample is further prepared by subdividing, cutting, sawing, coring, mixing, drying, grinding, and curing or by combinations of these operations, the result is the test sample. When no preparation of the laboratory sample is required, the laboratory sample is the test sample. A test portion is removed from the test sample for the performance of the test/ analysis or for the preparation of a test specimen.

Note 1 to entry: The laboratory sample is the final sample from the point of view of sample collection but it is the initial sample from the point of view of the laboratory.

[SOURCE: EN 16687:2015, 3.2.1]

3.6
test sample
analytical sample
sample, prepared from the laboratory sample, from which test portions are removed for testing or for analysis

[SOURCE: EN 16687:2015, 3.2.2]

3.7
test portion
analytical portion
amount of the test sample taken for testing/analysis, usually of known weight or volume

[SOURCE: EN 16687:2015, 3.2.3]

3.8
method detection limit
MDL
smallest analyte concentration that can be detected with a specified analytical method including sample preparation with a defined statistical probability

[SOURCE: EN 16687:2015, 4.1.12]

4 Abbreviations

For the purposes of this document, the following abbreviations apply.

CV-AAS	Cold vapour atomic absorption spectrometry
CV-AFS	Cold vapour atomic fluorescence spectrometry
DOC	Dissolved organic carbon
GF-AAS	Graphite furnace atomic absorption spectrometry
HG-AAS	Hydride generation atomic absorption spectrometry
IC	Ion chromatography
ICP	Inductively coupled plasma
ISE	Ion selective electrode
MDL	Method detection limit (limit of detection)
MS	Mass spectrometry
OES	Optical emission spectrometry
TOC	Total organic carbon

5 Sample pre-treatment

The eluate shall be analysed for the total content of the elements and anions of interest. If precipitation occurs between the preparation of the eluate and the analysis it is necessary to ensure by appropriate methods (e.g. redissolution, separate analysis of solution and precipitate) that the total content of the substances of interest is determined. If the eluate results from a procedure including 0,45 µm membrane filtration, analytical results refer to the content obtained from the leaching process.

Eluates are susceptible to be changed to different extents as a result of physical, chemical or biological reactions which can take place between the time of leaching and the analysis. pH shall be determined as soon as possible after preparation of the eluates and prior to sample pre-treatment. In case of collection of eluates over periods of days, the time between completing eluate collection and pH measurement shall not exceed 18 h (overnight).

NOTE As noted in prEN 16637-2 [4] and prEN 16637-3 [5] measures can be taken to avoid eluate deterioration by carbonation through CO_2 uptake in alkaline eluates.

Split the eluate (the laboratory sample) into an adequate number of test samples for different chemical analyses. Take the necessary precautions and make preservations according to the requirements in EN ISO 5667-3.

One specific test sample may be an untreated aliquot of the laboratory sample for the analysis of anions such as chloride, bromide, fluoride and sulphate, as well as for the determination of electrical conductivity.

For safety reasons it is recommended to acidify the test portion under a hood as volatile toxic substances can be generated.

6 Selection of suitable analytical test method

6.1 Table of test methods

Select the appropriate standardized test method listed in Table 1 according to the type of eluate, the concentration range of the substances of interest, regulatory requirements, the expected interferences and the precision needed.

For analytical quality control purposes ISO/TS 13530 and EN ISO/IEC 17025 should be considered.

6.2 General validation information

A selection of the test methods listed in Table 1 are validated by CEN/TC 351 through robustness validation [6] and [7] and in an interlaboratory trial for a limited number of construction product matrices [8]. Their suitability for other construction product eluates shall be checked in the laboratory performing the analysis.

It is pointed out that the standardized test methods listed in Table 1 have primarily been developed for the analysis of water samples. Most of them were validated by CEN/TC 292 in an interlaboratory trial for a limited number of eluates from various matrices [9], [10]. The validation data on these other matrices obtained in the evaluation of the analytical performance of laboratories are given in EN 16192:2011 [2] and [11], [12], [13], [14], [15] and [16].

Those analytical methods cited in Table 1 that have not been validated in the CEN/TC 292 interlaboratory trial in 1999-2001, have the matrix waste water and/or leachates included in their scope, and they proved to be applicable for the analysis of eluates in routine analyses.

If the methods referred to in Table 1 are found to be inappropriate by reason of, for example, detection limits, repeatability or interferences, other methods validated for water analysis may be used. Their suitability for construction product eluates shall be checked in the laboratory performing the analysis. The reason for the deviation shall be stated in the test report.

The values for MDL as listed in Table 1 are indicative values in the sense that they are not to be used as sole guideline to select between methods to be applied. An actual MDL will depend on the equipment, matrix properties, interferences and laboratory experience. If based on better precision for the listed methods another MDL is chosen than the MDL that would result from applying the tabulated values, this shall be mentioned in the test report.

Table 1 — Parameters and test methods for eluates

Parameter	Test method	Method type	Indicative analytical sensitivity – method detection limit (MDL) (µg/l)
General parameters			
pH	EN ISO 10523		0,1 unit
Electrical conductivity	EN 27888		2,0 mS/m
DOC/TOC	EN 1484		200 (as C)
Anion			
Cl^-, Br^-, F^-, SO_4^{2-}	EN ISO 10304-1	IC	Cl^-, F^-, SO_4^{2-} 100 Br^- 50
F^- [a]	ISO 10359-1	ISE	F^- 200

Parameter	Test method	Method type	Indicative analytical sensitivity – method detection limit (MDL) (µg/l)
Major, minor and trace elements			
Ag, Al, As, B, Ba, Be, Bi, Ca, Cd, Ce, Co, Cr, Cu, Fe, Hg, K, La, Li, Mg, Mn, Mo, Na, Nd, Ni, P, Pb, Pr, Total S, Sb, Sc, Se, Si, Sm, Sn, Sr, Te, Th, Ti, Tl, U, V, W, Zn and Zr	prEN 17197	ICP-OES	Be, Cd, Mn, Sc, Sr 1 Ba, Cr, Ni 2 Co, Cu, V, Zn 3 Mo 4 B, Hg, Pb, Tl, Ti 5 Se 7 Al, Ca, Fe, La, Zr, U 10 As 14 Ag, Bi, K, Li, Mg, Na, P, Total S, Sb, Si, W 20 Pr, Sm, Te 40 Ce 50 Nd, Sn 100 Th no data
Ag, Al, As, Au, Ba, Be, Bi, B, Cd, Ce, Ca, Cr, Co, Cs, Cu, Dy, Er, Eu, Fe, Ga, Gd, Ge, Hf, Hg, Ho, In, Ir, K, La, Li, Lu, Mg, Mo, Mn, Na, Nd, Ni, P, Pb, Pd, Pr, Pt, Rb, Re, Rh, Ru, Total S, Sb, Sc, Se, Si, Sm, Sn, Sr, Tb, Te, Th, Ti, Tl, Tm, U, V, W, Y, Yb, Zn and Zr	prEN 17200	ICP-MS	Ce, Dy, Er, Eu, Gd, Hf, Ho, In, Ir, La, Lu, Nd, Pr, Rb, Re, Rh, Ru, Sm, Tb, Th, Tl, Tm, U, Y 0,1 Co, Pb, Sb, Yb, Zr 0,2 Cd, Ga, Ge, Mo, W 0,3 Au, B, Be, Bi, Pd, Pt, Sr 0,5 Ag, As, Cr, Cu, Li, Ni, Sn, Ti, V 1 P, Zn 2 Ba, Mn 3 Al, Hg, Sc, Te 5 B, Mg, Na, Se, Si 10 Ca, Fe, K 50 Total S 1000
More sensitive methods			
As, Sb	ISO 17378-1	HG-AFS	
As, Sb	ISO 17378-2	HG-AAS	
Cd	EN ISO 15586	GF-AAS	0,3
Hg	EN ISO 12846	CV-AAS	0,01
	EN ISO 17852	CV-AFS	0,002
Sb, Se	EN ISO 15586	GF-AAS	Sb 3 Se 6
Se	ISO/TS 17379-1	HG-AFS	
Se	ISO/TS 17379-2	HG-AAS	

[a] In case of interference with carbonate.