SLOVENSKI STANDARD
SIST EN 900:2008

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Nadomešča:
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Kemikalije, ki se uporabljajo za pripravo pitne vode - Kalcijev hipoklorit

Chemicals used for treatment of water intended for human consumption - Calcium hypochlorite

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Calciumhypochlorit

Produits chimiques utilisés pour le traitement de l'eau destinée a la consommation humaine - Hypochlorite de calcium

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Chemicals used for treatment of water intended for human consumption - Calcium hypochlorite

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Contents

Foreword

This document (EN 900:2007) has been prepared by Technical Committee CEN/TC 164 “Water supply”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2008, and conflicting national standards shall be withdrawn at the latest by May 2008.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 900:1999.

Significant technical differences between this edition and EN 900:1999 are as follows:

a) deletion of the reference to EU Directive 80/778/EEC of 15 July 1980 in order to take account of the latest Directive in force (see [1]);

b) amended values regarding the maximum water content and water soluble substance;

c) updated references in regard to the determination of mercury;

d) revision of warning and safety precautions notes;

e) incorporation of Annex D (informative).

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

With respect to potential adverse effects on the quality of water intended for human consumption caused by the product covered by this European Standard:

a) this European Standard provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA;

b) it should be noted that, while awaiting the adoption of verifiable European criteria, existing national regulations concerning the use and/or the characteristics of this product remain in force.

NOTE Conformity with this European Standard does not confer or imply acceptance or approval of the products in any of the Member States of the EU or EFTA. The use of the products covered by this European Standard is subject to regulation or control by National Authorities.

1 Scope

This European Standard is applicable to calcium hypochlorite used for the treatment of water intended for human consumption. It describes the characteristics of calcium hypochlorite and specifies the requirements and the corresponding test methods for calcium hypochlorite. It provides information on its use in water treatment. It also determines the rules relating to safe handling and use of calcium hypochlorite (see Annex B).

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 1483, *Water quality - Determination of mercury - Method using atomic absorption spectrometry*

EN ISO 3696, *Water for analytical laboratory use - Specification and test methods (ISO 3696:1987)*

ISO 3165, *Sampling of chemical products for industrial use - Safety in sampling*

ISO 6206, *Chemical products for industrial use - Sampling – Vocabulary*

ISO 8213, *Chemical products for industrial use - Sampling techniques - Solid chemical products in the form of particles varying from powders to coarse lumps*

ISO 8288, *Water quality - Determination of cobalt, nickel, copper, zinc, cadmium and lead - Flame atomic absorption spectrometric methods*

ISO 9174, *Water quality - Determination of chromium - Atomic absorption spectrometric methods*

3 Description

3.1 Identification

3.1.1 Chemical name

Calcium hypochlorite.

3.1.2 Synonym or common name

None.

3.1.3 Relative molecular mass

142,99.

3.1.4 Empirical formula

$Ca(ClO)_2$.

3.1.5 Chemical formula

$Ca(ClO)_2$.

3.1.6 CAS Registry Number [1)]

7778-54-3.

3.1.7 EINECS reference [2)]

231-908-7.

3.2 Commercial form

The product is available as a granular solid or in the form of tablets.

3.3 Physical properties

3.3.1 Appearance

The product is white free-flowing granules or white tablets.

3.3.2 Density

The bulk density is approximately 0,8 g/cm^3 to 1 g/cm^3 for loose granular material and 1,2 g/cm^3 to 1,3 g/cm^3 for tablets, while the density of one tablet is approximately 1,7 g/cm^3 to 1,9 g/cm^3.

3.3.3 Solubility in water

The solubility is 180 g/l at 25 °C.

3.3.4 Vapour pressure

Not applicable.

3.3.5 Boiling point at 100 kPa [3)]

Not applicable.

3.3.6 Melting point

Not applicable as the product decomposes at 177 °C.

3.3.7 Specific heat

Not known.

3.3.8 Viscosity, dynamic

Not applicable.

3.3.9 Critical temperature

Not applicable.

[1)] Chemical Abstracts Service Registry Number.

[2)] European Inventory of Existing Commercial Chemical Substances.

[3)] 100 kPa = 1 bar.

3.3.10 Critical pressure

Not applicable.

3.3.11 Physical hardness

Not applicable.

3.4 Chemical properties

Solutions of calcium hypochlorite are alkaline. The pH value of a solution of concentration 10 g/l is about 11,5 at 25 °C.

Calcium hypochlorite is a strong oxidant and chlorination agent. It reacts with acids or acidic salts to form chlorine, and can form explosive nitrogen chlorides with ammonia and ammonia compounds. In the presence of inflammable substances, it causes fires and explosions of organic compounds, oxidation reactions occur with the release of heat and of moisture, and it is also highly corrosive to most metals.

4 Purity criteria

4.1 General

This European Standard specifies the minimum purity requirements for calcium hypochlorite used for the treatment of water intended for human consumption. Limits are given for impurities commonly present in the product. Depending on the raw material and the manufacturing process other impurities may be present and if so, then the user, and when necessary the relevant authorities, shall be notified.

NOTE Users of the product should check the national regulations to clarify whether it is of appropriate purity for treatment of water intended for human consumption, taking into account raw water quality, required dosage, contents of other impurities and additives used in the product not stated in this product standard.

Limits have been given for impurities and chemical parameters where these are likely to be present in significant quantities from the current production process and raw materials. If in the production process or raw materials lead to significant quantities of impurities, by-products or additives being present, this shall be notified to the user.

4.2 Composition of commercial product

The product shall contain a minimum of a mass fraction of 65,5 % of calcium hypochlorite (equivalent to an available active chlorine content of at least a mass fraction of 65 %.

Dissolution quality, calculated as available chlorine which is obtainable within 1 min after dissolution in water, shall not be less than a mass fraction of 45, 5 %.

NOTE The water content at the time of delivery should not exceed a mass fraction of 16 % of the product. As the test method is usually not conducted by the user without danger of explosion, the manufacturer should guarantee to maintain this value. If necessary a test laboratory can be requested to carry out this test. This determination should be carried out by specialists only.

4.3 Impurities and main by-products

The sodium chloride content shall not exceed a mass fraction of 18 % of the product.

The content of water-insoluble matter shall not exceed a mass fraction of 6 % of the product.

NOTE 1 The water insoluble matter consists mainly of carbonates.

NOTE 2 Calcium chlorate can be present as a by-product of the production process.

4.4 Chemical parameters

The product shall conform to the requirements specified in Table 1.

Table 1 – Chemical parameters

Parameter		Limit in mg/kg of available chlorine	
		Type 1	Type 2
Arsenic (As)	max.	5	10
Cadmium (Cd)	max.	5	10
Chromium (Cr)	max.	15	15
Mercury (Hg)	max.	5	7
Nickel (Ni)	max.	8	10
Lead (Pb)	max.	15	15
Antimony (Sb)	max.	15	15
Selenium (Se)	max.	20	20
		Limit in g/kg of available chlorine	
Bromate	max.	2,1	4,2

[a] Bromate is a by-product of the manufacturing process.

NOTE Cyanide, which does not exist in a strong oxidizing medium such as calcium hypochlorite is not a relevant chemical parameters. Pesticides and polycyclic aromatic hydrocarbons are not by-products of the manufacturing process. For parametric values of calcium hypochlorite on trace metal content in drinking water, see [1].

5 Test methods

5.1 Sampling

Observe the general recommendations of ISO 3165 and take account of ISO 6206. Prepare the laboratory sample(s) required by the relevant procedure described in ISO 8213.

5.2 Analysis

5.2.1 Determination of calcium hypochlorite content (main product)

5.2.1.1 Principle

Calcium hypochlorite reacts with potassium iodide to release iodine in the presence of acetic acid. The iodine is titrated with sodium thiosulfate standard volumetric solution in the presence of starch indicator solution.

NOTE 1 It detects all oxidizing agents being active in a weak acidic solution, i.e. hypochlorite/chlorine, iodate, and partially chloramines, Fe(III), etc. Not covered under these conditions are bromate and chlorate.

NOTE 2 The titration can also be carried out potentiometrically by the aid of titration automates; the addition of soluble starch is then unnecessary.

5.2.1.2 Reagents

All reagents shall be of a recognized analytical grade and the water used shall conform to grade 3 specified in EN ISO 3696.

5.2.1.2.1 Potassium iodide crystals (KI).

5.2.1.2.2 Glacial acetic acid.

5.2.1.2.3 Sodium thiosulfate standard volumetric solution, $c(Na_2S_2O_3.5H_2O)$ = 0,1 mol/l.

Standard volumetric solutions are commercially available; eventually they have to be diluted.
Alternatively a standard volumetric solution can be prepared by the following procedure:

Dissolve 24,8 g $Na_2S_2O_3$. 5 H_2O in a 1 000 ml one-mark volumetric flask in about 0,75 l water. After the temperature has equalized make up to the mark with water and mix thoroughly.

To standardize: Weigh, to the nearest 0,1 mg, 3,600 g (m) of dry potassium iodate. Dissolve in water in a 1 000 ml one-mark volumetric flask, make up to the mark with water and mix (standard reference solution $c(1/6\ KIO_3)$ = 0,1 mol/l). Place 200 ml of water in a 500 ml stoppered conical flask, add (2 ± 0,5) g of potassium iodide and stir to dissolve. Then introduce by means of a pipette, 10,0 ml of sodium thiosulfate solution for standardization , add (15 ± 1) ml of hydrochloric acid solution (diluted 1 + 1 by volume) and (5 ± 1) ml of starch solution (5.2.1.2.4). Titrate immediately with the potassium iodate standard reference solution until the appearance of a blue coloration persisting for at least 30 s. Record the volume *(V)* of iodate used.

The concentration, c, of the sodium thiosulfate standard volumetric solution ($Na_2S_2O_3.5H_2O$), expressed in moles per litre is given by the following equation:

$$c = \frac{m}{V \times 49{,}0317} \qquad (1)$$

where

m is the mass, in milligrams, of potassium iodate (KIO_3) weighed;

V is the volume, in millilitres, of the sodium thiosulfate standard volumetric solution used.

5.2.1.2.4 Starch solution, mass fraction 1 %.

Make a slurry with (1 ± 0,1) g starch and (5 ± 1) ml water. Add (90 ± 5) ml boiling water to the slurry. Stir to dissolve it and cool the solution. This solution needs refrigeration to avoid the decomposition of the starch which results in a vague end point. Keep the solution cool and use it within one week.

NOTE Commercial indicators for iodine titration exist and can be used in place of the described starch solution provided that their efficiency has been previously tested.

5.2.1.3 Apparatus

Ordinary laboratory apparatus and glassware, together with the following:

Laboratory sonic vibrator.

5.2.1.4 Procedure

5.2.1.4.1 Test portion

Weigh, to the nearest 0,1 mg, 3,5 g of the laboratory sample *(m_1)* into a tarred stoppered weighing bottle.