SLOVENSKI STANDARD
SIST EN 12386:2005

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Nadomešča:
SIST EN 12386:2000

Kemikalije, ki se uporabljajo za pripravo pitne vode - Bakrov sulfat

Chemicals used for treatment of water intended for human consumption - Copper sulfate

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Kupfersulfat

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

Ta slovenski standard je istoveten z: **EN 12386:2005**

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13.060.20	Pitna voda	Drinking water
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EUROPEAN STANDARD

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English version

Chemicals used for treatment of water intended for human consumption - Copper sulfate

Produits chimiques utilisés pour le traitement de l'eau destinée à la consommation humaine - Sulfate de cuivre

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Kupfersulfat

This European Standard was approved by CEN on 12 May 2005.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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Foreword

This European Standard (EN 12386:2005) 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of an identical text or by endorsement, at the latest by December 2005, and conflicting national standards shall be withdrawn at the latest by December 2005.

This document supersedes EN 12386:1998.

Significant technical differences between this edition and EN 12386:1998 are as follows:

— 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]).

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

Introduction

In respect of 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 product in any of the Member States of the EU or EFTA. The use of the product covered by this European Standard is subject to regulation or control by National Authorities.

1 Scope

This European Standard is applicable to copper (II) sulfate pentahydrate used for treatment of water intended for human consumption. It describes the characteristics and specifies the requirements of copper (II) sulfate pentahydrate and refers to the corresponding analytical methods. It gives information for its use in water treatment. It also determines the rules relating to safe handling and use of copper (II) sulfate pentahydrate (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 reference document (including any amendments) applies.

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 4793, *Laboratory sintered (fritted) filters - Porosity grading, classification and designation*

ISO 5993, *Sodium hydroxide for industrial use - Determination of mercury content - flameless atomic absorption spectrometric method*

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

ISO 6332, *Water quality - Determination of iron - Spectrometric method using 1,10-phenanthroline*

ISO 6353-1, *Reagents for chemical analysis - Part 1 General test methods*

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

3 Description

3.1 Identification

3.1.1 Chemical name

Copper (II) sulfate pentahydrate.

3.1.2 Synonym or common names

Copper vitriol, blue vitriol, cupric sulfate.

3.1.3 Relative molecular mass

For pentahydrate: 249,69.

3.1.4 Empirical formula

$CuSO_4.5H_2O$.

3.1.5 Chemical formula

$CuSO_4.5H_2O$.

3.1.6 CAS-Registry Number[1)]

anhydrous form:7758-98-7.

pentahydrate: 7758-99-7.

3.1.7 EINECS reference[2)]

231-847-6 (anhydrous form).

3.2 Commercial form

The product is a powder or crystals.

3.3 Physical properties

3.3.1 Appearance

The product is a powder or crystals, with a deep blue colour.

3.3.2 Density

The density of the copper (II)sulfate pentahydrate is 2,28 g/cm³ at 20 °C.

3.3.3 Solubility in water

The solubility of the copper (II) sulfate pentahydrate is 266 g/l at 20 °C.

3.3.4 Vapour pressure

Not applicable.

3.3.5 Boiling point at 100 kPa[3)]

Not applicable.

3.3.6 Melting point

The product decomposes above 300 °C.

3.3.7 Specific heat

Not known.

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1) Chemical Abstracts Service Registry Number

2) European Inventory of Existing Commercial Chemical Substances

3) 100 kPa = 1 bar

3.3.8 Viscosity, dynamic

Not applicable.

3.3.9 Critical temperature

Not applicable.

3.3.10 Critical pressure

Not applicable.

3.3.11 Physical hardness

Not applicable.

3.4 Chemical properties

Copper sulfate pentahydrate dehydrates partially at 29 °C and entirely at 250 °C. The pH value of an aqueous solution with a concentration of 10 g/l $CuSO_4$ is in the range 3,5 to 4. If thermal decomposition occurs, SO_2 is released.

4 Purity criteria

4.1 General

This European Standard specifies the minimum purity requirements for copper sulfate pentahydrate 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, this shall be notified to the user and when necessary to relevant authorities.

NOTE Users of this product should check the national regulations in order 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 chemiçal parameters where these are likely to be present in significant quantities from the current production process and raw materials. If the production process or raw materials leads 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 content of copper sulfate pentahydrate shall not be less than a mass fraction of 98%.

4.3 Impurities and main by-products

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

Table 1 - Impurities

Impurity		Limit in product (pentahydrate)
Insoluble matter	max.	Mass fraction 0,5 %
Moisture	max.	Mass fraction 0,5 %
Free sulfuric acid	max.	Mass fraction 0,2 %
Iron (Fe)	max.	200 mg/kg

4.4 Chemical parameters

The product shall conform to the requirements specified in Table 2.

Table 2 – Chemical parameters

Parameter		Limit mg/kg of product (pentahydrate)
Antimony (Sb)	max.	1
Arsenic (As)	max.	5
Cadmium (Cd)	max.	10
Chromium (Cr)	max.	5
Lead (Pb)	max.	70
Mercury (Hg)	max.	0,1
Nickel (Ni)	max.	100
Selenium (Se)	max.	1
NOTE Cyanides (CN^-), pesticides and polycyclic aromatic hydrocarbons are not relevant because the raw materials used in the manufacturing process are free of them. For parametric values of copper sulfate pentahydrate on trace metal content in drinking water, see [1].		

5 Test methods

5.1 Sampling

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

5.2 Analyses

5.2.1 Main product

NOTE For routine method see Annex C.

5.2.1.1 Principle

The copper content is determined electrolytically.

5.2.1.2 Reagents

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

5.2.1.2.1 Nitric acid concentrated, ρ = 1,40 g/ml.

5.2.1.2.2 Sulfuric acid concentrated, ρ = 1,84 g/ml.

5.2.1.2.3 Ethanol, solution volumic fraction 95 %.

5.2.1.3 Apparatus

Ordinary laboratory apparatus and glassware, together with the following:

5.2.1.3.1 Direct current supply

5.2.1.3.2 Tared, perforated platinum cylinder cathode

5.2.1.3.3 Platinum wire anode

5.2.1.4 Test sample

Mix a 500 g sample thoroughly and place approximately 100 g of this material in a properly stoppered glass container.

5.2.1.5 Procedure

Weigh out a test portion of approximately 5g (*m*) of copper sulfate pentahydrate as rapidly as possible and transfer quantitatively to a tall-form 400 ml beaker. Dissolve the test portion in 350 ml water and then add 10 ml H_2SO_4 (5.2.1.2.2). Allow the solution to cool to room temperature.

Deposit the copper electrolytically on a tared, perforated, platinum cylinder cathode (5.2.1.3.2), with a straight platinum wire (5.2.1.3.3) for the anode. Cover the beaker carefully with a split watch glass to prevent loss by spraying.

Apply a current density of 0,5 A/dm² of cathode area until deposition is complete. The cathode area equals gross area of inside of cylinder, including perforations. It is customary to conduct this operation overnight. When the solution is colourless, wash down the watch glass, electrodes and sides of beaker, raising the level of the liquid slightly, and continue the electrolysis for 15 min, noting whether or not copper is deposited on the newly exposed surface of the platinum. If copper appears, raise the level of the liquid and continue the electrolysis until none appears on the electrode. The completion of electrolysis can be determined by testing a few drops of the solution on a spot plate with saturated hydrogen sulfide solution. Electrolysis is complete when no copper sulfide colouration is observed.

When electrolysis is complete, remove the cathode quickly while washing with water from a wash bottle and then rinse the cathode in two successive baths of ethanol 95 % (5.2.1.2.3). Dry in oven at 110 °C for 3 min, cool and weigh as metallic copper.