SLOVENSKI STANDARD
SIST EN 889:2005

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Nadomešča:
SIST EN 889:2000

Kemikalije, ki se uporabljajo za pripravo pitne vode - Železov (II) sulfat

Chemicals used for treatment of water intended for human consumption - Iron (II) sulfate

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Eisen (II) sulfat

Produits chimiques utilisés pour le traitement de l'eau destinée a la consommation humaine - Sulfate de fer (II)

Ta slovenski standard je istoveten z: EN 889:2004

ICS:

13.060.20	Pitna voda	Drinking water
71.100.80	Kemikalije za čiščenje vode	Chemicals for purification of water

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EUROPEAN STANDARD

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English version

Chemicals used for treatment of water intended for human consumption - Iron (II) sulfate

Produits chimiques utilisés pour le traitement de l'eau destinée à la consommation humaine - Sulfate de fer (II)

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Eisen (II) sulfat

This European Standard was approved by CEN on 30 September 2004.

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Contents

Foreword

This document (EN 889:2004) 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of an identical text or by endorsement, at the latest by May 2005, and conflicting national standards shall be withdrawn at the latest by May 2005.

This document supersedes EN 889:1998.

Significant technical differences between this edition and EN 889:1998 are as follows:

a) replacement of the reference of to EU Directive 80/778 of 15 July 1980 with the latest Directive in force (see[1]);

b) expansion of annex A by addition of A.2 "quality of commercial product";

c) deletion of annex D.

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 Standard:

a) this 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 the 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 document is subject to regulation or control by National Authorities.

1 Scope

This document is applicable to iron (II) sulfate heptahydrate used for treatment of water intended for human consumption. It describes the characteristics of iron (II) sulfate heptahydrate and specifies the requirements and the corresponding analytical methods for iron (II) sulfate heptahydrate (analytical methods are given in Annex B) and gives information on its use in water treatment.

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 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*.

3 Description

3.1 Identification

3.1.1 Chemical name

Iron (II) sulfate heptahydrate.

3.1.2 Synonym or common names

Ferrous sulfate, iron vitriol, copperas, green salt.

3.1.3 Relative molecular mass

278,02.

3.1.4 Empirical formula

$FeSO_4 . 7H_2O$.

3.1.5 Chemical formula

$FeSO_4 . 7H_2O$.

3.1.6 CAS Registry Number[1)]

7782-63-0 ($FeSO_4 . 7H_2O$).

7720-78-7 ($FeSO_4$).

3.1.7 EINECS reference[2)]

231-753-5 ($FeSO_4$).

3.2 Commercial forms

The iron (II) sulfate heptahydrate is available as wet crystals (a) or free-flowing crystals (b).

3.3 Physical properties

3.3.1 Appearance

The iron (II) sulfate heptahydrate is a light green crystal.

3.3.2 Density

The density of iron (II) sulfate heptahydrate is equal to 1,9 g/cm^3 at 20 °C.

The bulk density of commercial form a) is equal approximately to 1 kg/dm^3 and of commercial form b) approximately to 0,8 kg/dm^3.

3.3.3 Solubility (in water)

The solubility of iron (II) sulfate heptahydrate is 487 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

For the iron (II) sulfate heptahydrate the melting starts at approximately 64 °C, leading to decomposition.

3.3.7 Specific heat

Not known.

3.3.8 Viscosity (dynamic)

Not applicable.

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1) Chemical Abstracts Service Registry Number.

2) European Inventory of Existing Commercial Chemical Substances.

3) 100 kPa = 1 bar.

3.3.9 Critical temperature

Not applicable.

3.3.10 Critical pressure

Not applicable.

3.3.11 Physical hardness

Not applicable.

3.4 Chemical properties

Iron (II) sulfate heptahydrate and especially solutions of iron (II) sulfate heptahydrate have acid and reducing properties. They react by oxidation or hydrolysis (depending on the pH).

4 Purity criteria

4.1 General

This document specifies the minimum purity requirements for iron (II) sulfate 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 chemical 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 product shall contain not less than a mass fraction of 82,1 % of $FeSO_4 \cdot 7H_2O$ (i.e. not less than a mass fraction of 16 % of Fe) and shall be within ± 3 % of the manufacturer's declared values.

4.3 Impurities and main by-products

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

The concentration limits refer to Fe (II).

Table 1 — Impurities

Impurity		Limit Mass fraction of Fe (II) content in %		
		Grade 1	Grade 2	Grade 3
Manganese	max.	0,5	1	2
Insoluble matters :				
- wet crystal form (a)	max.	0,6	0,6	0,6
- free flowing form (b)	max.	3	3	3
NOTE An excess of insoluble matters indicates the presence of foreign matter. Iron as a component of the product will usually be removed in the treatment process.				

4.4 Chemical parameters

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

The concentration limits are specified in milligrams per kilogram of Fe (II).

Table 2 — Chemical parameters

Parameter		Limit in mg/kg of Fe (II)		
		type 1	type 2	type 3
Arsenic (As)	max.	1	20	50
Cadmium (Cd)	max.	1	25	50
Chromium (Cr)	max.	100	350	500
Mercury (Hg)	max.	0,1	5	10
Nickel (Ni)	max.	300	350	500
Lead (Pb)	max.	10	100	400
Antimony (Sb)	max.	10	20	60
Selenium (Se)	max.	1	20	60
NOTE Cyanide (CN^-),pesticides and polycyclic aromatic hydrocarbons are not relevant since the raw materials used in the manufacturing process are free of them. For maximum impact of iron (II) sulfate on trace metal content in drinking water see A.2.				

5 Test methods

5.1 Sampling

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

5.2 Analyses

5.2.1 Main product

Iron (II) sulfate is determined as Fe (II) content in the test sample by titrimetry with potassium dichromate solution (see B.1).

5.2.2 Impurities

5.2.2.1 Manganese

The manganese content shall be determined by flame atomic absorption spectrometry (FAAS) (see B.2).

5.2.2.2 Insoluble matters

The percentage mass fraction of the insoluble matters shall be determined in accordance with the method described in B.3.

5.2.3 Chemical parameters

5.2.3.1 General

The contents of chemical parameters shall be determined by atomic absorption spectrometry (AAS).

5.2.3.2 Preparation of sample solution

5.2.3.2.1 General

Oxidation and wet digestion is used to bring the samples into a stable solution.

5.2.3.2.2 Principle

Oxidation with hydrogen peroxide (H_2O_2) followed by digestion with hydrochloric acid (HCl).

5.2.3.2.3 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.

5.2.3.2.3.1 Hydrochloric acid (HCl), solution, mass fraction 30 %.

5.2.3.2.3.2 Hydrogen peroxide (H_2O_2), solution, mass fraction 30 %.

5.2.3.2.4 Apparatus

Ordinary laboratory apparatus and glassware together with the following

5.2.3.2.4.1 Analytical balance.

5.2.3.2.4.2 Graduated cylinder, capacity 50 ml.

5.2.3.2.4.3 Round flask with reflux condenser.

5.2.3.2.4.4 Hot plate.

5.2.3.2.4.5 Volumetric flask, capacity 200 ml.

5.2.3.2.5 Procedure

Dissolve with 20 ml of water 20,0 g of the iron salt. Add to iron (II)-samples 30 ml hydrogen peroxide solution (5.2.3.2.3.2). After adding 50 ml hydrochloric acid (5.2.3.2.3.1) boil the solution for 15 min by using a reflux condenser (5.2.3.2.4.3). Cool down the solution, transfer to a 200 ml volumetric flask (5.2.3.2.4.5) and fill up to the mark with water. This is the sample solution.

5.2.3.3 Arsenic

The arsenic content shall be determined by hydride generation atomic absorption spectrometry (see B.4).

5.2.3.4 Cadmium

The cadmium content shall be determined by graphite furnace atomic absorption spectrometry (see B.6).

5.2.3.5 Chromium

The chromium content shall be determined by graphite furnace atomic absorption spectrometry (see B.6).

5.2.3.6 Mercury

The mercury content shall be determined by cold vapour atomic absorption spectrometry (see B.5).

5.2.3.7 Nickel

The nickel content shall be determined by graphite furnace atomic absorption spectrometry (see B.6).

5.2.3.8 Lead

The lead content shall be determined by graphite furnace atomic absorption spectrometry (see B.6).

5.2.3.9 Antimony

The antimony content shall be determined by hydride generation atomic absorption spectrometry (see B.4).

5.2.3.10 Selenium

The selenium content shall be determined by hydride generation atomic absorption spectrometry (see B.4).