SLOVENSKI STANDARD
SIST EN 889:2000

01-november-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 889:1998**

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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EN 889

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ICS 71.100.80

Descriptors: potable water, water treatment, chemical compounds, iron sulphates, description, physical properties, chemical properties, impurities, toxic substances, tests, labelling, storage, utilization

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 24 July 1998.

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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.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Contents

Foreword

This European Standard 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of an identical text or by endorsement, at the latest by February 1999, and conflicting national standards shall be withdrawn at the latest by February 1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the 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 :

1) 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 ;

2) 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.

1 Scope

This European Standard 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 and gives information on its use in water treatment.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to 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

a) Wet crystals.

b) Free-flowing crystals.

3.3 Physical properties

3.3.1 Appearance

Light green crystals.

3.3.2 Density

1,9 g/cm^3 at 20 °C.

Bulk density :

- commercial form a) approximately 1 kg/dm^3 ;
- commercial form b) approximately 0,8 kg/dm^3.

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1) Chemical Abstracts Service Registry Number.
2) European Inventory of Existing Commercial Chemical Substances.

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

Melting starts at approximately 64 °C, leading to decomposition.

3.3.7 Specific heat

Not known.

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

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).

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3) 100 kPa = 1 bar.

4 Purity criteria

Limits have been given for impurities and toxic substances where these are likely to be present in significant quantities from the current production process and raw materials. If a change in the production process or raw materials leads to significant quantities of other impurities or by-products being present, this shall be notified to the user.

4.1 Composition of commercial product

The product shall contain not less than 82,1 % (*m/m*) of $FeSO_4 . 7H_2O$ (i.e. not less than 16 % (*m/m*) of Fe).

4.2 Impurities and main by-products

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

The concentration limits refer to iron (Fe).

Table 1 : Impurities

Impurity		Limit % (*m/m*) of Fe content		
		Level 1	Level 2	Level 3
Manganese	max.	0,5	1	2
Insolubles :				
- wet crystal form	max.	0,6	0,6	0,6
- free flowing form	max.	3	3	3
NOTE : An excess of insolubles indicates the presence of foreign matter.				

4.3 Toxic substances

NOTE : For the purpose of this standard, "toxic substances" are those defined in the EU Directive 80/778/EEC of 15 July, 1980 (see D.1).

The content of toxic substances shall conform to the requirements specified in table 2.

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

Table 2 : Toxic substances

Element		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 : Cyanides, pesticides and polycyclic aromatic hydrocarbons are not relevant toxic substances as listed in EU Directive 80/778/EEC because they are not likely to be found in the raw materials.				

5 Test methods

5.1 Sampling

Observe the general recommandations 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 Analyses

5.2.1 Main product

Iron(II) sulfate is determined as Fe 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 matter

The percentage by mass % (*m*/*m*) of the insoluble matter shall be determined in accordance with the method described in B.3.

5.2.3 Toxic substances

5.2.3.1 General

The contents of toxic substances 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 in 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

5.2.3.2.3.1 Hydrochloric acid (HCl), solution 30 % (*m*/*m*).

5.2.3.2.3.2 Hydrogen peroxide (H_2O_2) solution, 30 % (*m*/*m*).

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, 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, 200 ml.

5.2.3.2.5 Procedure

Dissolve with 20 ml of distilled water 20,0 g of the iron salt or iron solution. 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 atomic absorption spectrometry hydride technique (see B.4).

5.2.3.4 Cadmium

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

5.2.3.5 Chromium

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

5.2.3.6 Mercury

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

5.2.3.7 Nickel

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

5.2.3.8 Lead

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

5.2.3.9 Antimony

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

5.2.3.10 Selenium

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

6 Labelling - Transportation - Storage

6.1 Means of delivery

In order that the purity of the product is not affected, the means of delivery shall not have been used previously for any different product or it shall have been specially cleaned and prepared before use.