SLOVENSKI STANDARD
SIST EN 12678:2008

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Nadomešča:
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Kemikalije, ki se uporabljajo za pripravo pitne vode - Kalijev peroksomonosulfat

Chemicals used for treatment of water intended for human consumption - Potassium peroxomonosulfate

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Kaliumperoxomonosulfat

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

Ta slovenski standard je istoveten z: **EN 12678:2008**

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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 - Potassium peroxomonosulfate

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

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Kaliumperoxomonosulfat

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Contents

Foreword

This document (EN 12678:2008) 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of an identical text or by endorsement, at the latest by January 2009, and conflicting national standards shall be withdrawn at the latest by January 2009.

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 12678:2000.

Significant technical difference between this edition and EN 12678:2000 is as follows:

— Deletion of reference to EU Directive 80/778/EEC of July 15, 1980 in order to take into account 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, 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

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 potassium peroxomonosulfate used for treatment of water intended for human consumption. It describes the characteristics of potassium peroxomonosulfate and specifies the requirements and the corresponding test methods for potassium peroxomonosulfate. It 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 1233, *Water quality - Determination of chromium - Atomic absorption spectrometric methods*

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 8288:1986, *Water quality - Determination of cobalt, nickel, copper, zinc, cadmium and lead - Flame atomic absorption spectrometric methods*

3 Description

3.1 Identification

3.1.1 Chemical name

Potassium peroxomonosulfate triple salt.

3.1.2 Synonym or common name

Potassium peroxomonosulfate, Potassium monopersulfate, Potassium hydrogenperoxomonosulfate, Pentapotassium-bis(peroxomonosulfate)bis(sulfate).

3.1.3 Relative molecular mass

Triple salt: 614,76.

(Active ingredient $KHSO_5$: 152,17)

3.1.4 Empirical formula of triple salt

$K_5H_3S_4O_{18}$ ($2\ KHSO_5.\ KHSO_4.\ K_2SO_4$)

Active ingredient $KHSO_5$.

3.1.5 CAS Registry Number[1)]

70693-62-8

3.1.6 EINECS reference[2)]

274-778-7

3.2 Commercial form

Potassium peroxomonosulfate as commercial product exists as a triple salt comprising potassium peroxomonosulfate ($2KHSO_5$) potassium hydrogen sulfate ($KHSO_4$) and potassium sulfate (K_2SO_4).

3.3 Physical properties of triple salt

3.3.1 Appearance and odour

The product is white, odourless, granular, free-flowing salt.

3.3.2 Density

The bulk density of the product is approximately between 1 g/cm^3 and 1,2 g/cm^3.

3.3.3 Solubility in water

The solubility of the product is:

— approximately 250 g/l at 20 °C;

— approximately 300 g/l at 50 °C;

— approximately 330 g/l at 70 °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 60 °C.

3.3.7 Specific heat

Not applicable.

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1) Chemical Abtracts 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

Potassium peroxomonosulfate is a powerful oxidizing agent. Aqueous solutions of the product exhibit a strongly acid reaction; a mass fraction solution of 3 % has a pH value of 2 at 20 °C.

The standard reduction potential E_0 of potassium peroxomonosulfate for the reaction:

$$HSO_5^- + 2H^+ + 2^{e-} \leftrightarrows HSO_4^- + H_2O \quad (1)$$

is:

+ 1,82 V at 25°C

4 Purity criteria

4.1 General

This European Standard specifies the minimum purity requirements for Potassium peroxomonosulfate 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 the 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 the product standard.

Limits have been given for impurities and chemicals 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 commercial product shall contain $KHSO_5$ (potassium peroxomonosulfate) at a mass fraction greater than 45 per cent or the manufacturer's declared values.

NOTE Typical composition in mass fraction should be approximately 45 % $KHSO_5$, potassium hydrogen sulfate ($KHSO_4$), 25 % and potassium sulfate (K_2SO_4) 30 % .

4.3 Impurities and main by-products

See 4.1.

4.4 Chemical parameters

NOTE For the purpose of this European Standard, “chemical parameters” are those defined in the EU Directive 98/83/EC of 3 November 1998 (see [1]).

The content of chemical parameters shall conform to the requirements specified in Table 1.

Table 1 - Chemical parameters

Parameter		Limit (mg/kg) of $KHSO_5$	
		Type 1	Type 2
Arsenic (As)	max.	2	10
Cadmium (Cd)	max.	1	10
Chromium (Cr)	max.	0,4	10
Mercury (Hg)	max.	4	8
Nickel (Ni)	max.	1	10
Lead (Pb)	max.	2	10
Antimony (Sb)	max.	10	10
Selenium (Se)	max.	10	10
NOTE Cyanide is usually not relevant in a strong oxidizing medium. Pesticides and polycyclic aromatic hydrocarbons are not by-products of the manufacturing process.			

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 potassium peroxomonosulfate ($KHSO_5$) (active ingredient)

5.2.1.1 Principle

Iodometric titration with sodium thiosulfate standard volumetric solution in sulfuric acid medium. The method depends on the oxidizing action of the peroxomonosulfate ion $(HSO_5)^-$ on iodide ions, Equation (2) and the subsequent determination of iodine formed, through the reducing agent sodium thiosulfate, Equation (3). The inflection point of the potentiometric titration is located around 250 mV (reference to Ag/AgCl-Electrode).

$$HSO_5^- + 3\ KI + H_2SO_4 \rightarrow HSO_4^- + KI_3 + K_2SO_4 + H_2O \quad (2)$$

$$KI_3 + 2\ Na_2S_2O_3 \rightarrow KI + 2\ NaI + Na_2S_4O_6 \quad (3)$$

5.2.1.2 Reagents

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

5.2.1.2.1 Sulfuric acid solution, mass fraction 25 %

Place 750 ml of water in a heat resistant beaker (volume 2 000 ml). Measure 135 ml of sulfuric acid, mass fraction 98 % , and dilute in the water by small additions and under gentle stirring. Cover the beaker with a watch glass and keep it for several hours in a safe place to cool.

SAFETY PRECAUTIONS: During dilution the solution becomes hot; wear safety goggles, protective gloves and protective clothing.

5.2.1.2.2 Hydrochloric acid solution, mass fraction 10 %

5.2.1.2.3 Potassium iodide solution, mass fraction 30 %

Weigh, to the nearest 0,1 g, 60 g of potassium iodide, iodate-free grade, and dissolve it in 140 ml of water. Keep the solution in a dark place.

5.2.1.2.4 Starch solution, mass fraction 1 %

Weigh 1,00 g of soluble starch and make a slurry with 5 ml of water. Add 95 ml of water to the slurry and boil for several minutes to dissolve it. Cool the solution. This solution needs refrigeration to avoid decomposition of the starch which results in a vague end point. Keep the solution cool and use it within one week.

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

5.2.1.2.5 Potassium iodate (KIO_3)

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

Standard volumetric solutions of sodium thiosulfate are commercially available.

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 makeup 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 occurs. Record the volume *(V_1)* of iodate used.

The actual 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 :

$$c = \frac{V_1 \times c_1}{V} \qquad (4)$$

where

c_1 is the concentration, expressed in moles per litre, of the potassium iodate standard reference solution *[c*(1/6 KIO_3) = 0,1 mol/l];