



SLOVENSKI STANDARD

SIST EN 12678:2001

01-december-2001

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

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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
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 12678

May 2000

ICS 71.100.80

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

This European Standard was approved by CEN on 3 April 2000.

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.

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.

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

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

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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 November 2000, and conflicting national standards shall be withdrawn at the latest by November 2000.

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.

Annex A is informative.

The annexes B and C are normative.

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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.

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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

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 1483, *Water quality - Determination of mercury.*

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 chemicals 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

Potassium peroxomonosulfate.

3.1.2 Synonym or common name

Potassium monopersulfate.

3.1.3 Relative molecular mass

a) Triple salt : 614,76 ;

b) Active ingredient KHSO_5 : 152,17.

3.1.4 Empirical formula of triple salt

$\text{K}_5\text{H}_3\text{S}_4\text{O}_{18}$ (2 KHSO_5 . KHSO_4 . K_2SO_4)

3.1.5 Chemical formula of active ingredient

KHSO_5 active ingredient.

3.1.6 CAS Registry Number¹⁾

70693-62-8 referring to KHSO_5 .

3.1.7 EINECS reference²⁾

274-778-7 referring to KHSO_5 .

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 $1,2 \text{ g/cm}^3$.

3.3.3 Solubility in water

The solubility of the product is :

- approximately 250 g/l at $20 \text{ }^\circ\text{C}$;
- approximately 300 g/l at $50 \text{ }^\circ\text{C}$;
- approximately 330 g/l at $70 \text{ }^\circ\text{C}$.

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3.3.4 Vapour pressure

Not applicable.

3.3.5 Boiling point at 100 kPa³⁾

Not applicable.

3.3.6 Melting point

The product decomposes above $60 \text{ }^\circ\text{C}$.

3.3.7 Specific heat

Not applicable.

¹⁾ Chemical Abstracts Service Registry Number.

²⁾ European inventory of Existing Commercial chemical Substances.

³⁾ $100 \text{ kPa} = 1 \text{ bar}$

3.3.8 Viscosity (dynamic)

Not applicable.

3.3.9 Critical temperature

Not applicable.

3.3.10 Critical pressure

Not applicable.

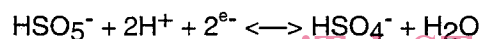
3.3.11 Physical hardness

Not applicable.

3.4 Chemical properties

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

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



is + 1,82 V at 25°C.

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4 Purity criteria

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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 commercial product shall contain KHSO_5 (potassium peroxomonosulfate) greater than 45 per cent by mass (% (*m/m*)) or agreed to manufacturer's values declared.

NOTE Typical composition should be approximately 45 % (*m/m*) KHSO_5 , potassium hydrogen sulfate (KHSO_4) approximately 25 % (*m/m*) and potassium sulfate (K_2SO_4) approximately 30 % (*m/m*).

4.2 Impurities and main by-products

See 4.1.

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 [1]).

The content of toxic substances shall conform to the requirements specified in table 1.

Table 1 - Toxic substances

| 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

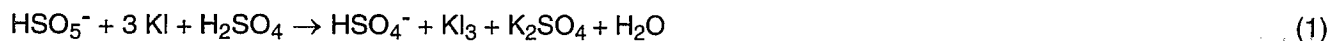
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5.2.1 Determination of potassium peroxomonosulfate (KHSO₅) (active ingredient)

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 (HSO₅⁻) on iodide ions, equation (1) and the subsequent determination of iodine formed, through the reducing agent sodium thiosulfate, equation (2). The inflection point of the potentiometric titration is located around 250 mV (reference to Ag/AgCl-Electrode).



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, 25 % (m/m)

Place 1 460 ml of water in a heat resistant beaker (volume 3 000 ml). Weigh (500 ± 5) g of sulfuric acid, 98 % (m/m), 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, 10 % (m/m)**5.2.1.2.3 Potassium iodide solution, 30 % (m/m)**

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, 1 % (m/m)

Weigh $(1,00 \pm 0,01)$ g of soluble starch and make a slurry with (5 ± 1) ml of water. Add (95 ± 1) 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 dichromate ($K_2Cr_2O_7$) primary standard**5.2.1.2.6 Sodium thiosulfate standard volumetric solution, $c(Na_2S_2O_3 \cdot 5H_2O) = 0,1$ mol/l**

Dissolve 24,8 g of $Na_2S_2O_3 \cdot 5H_2O$ in water. Add 0,5 ml of chloroform as preservative, dilute to volume with water in a 1 000 ml one-mark volumetric flask and mix thoroughly.

To standardize : weigh, to the nearest 0,1 mg, (160 ± 10) mg (m) of primary standard potassium dichromate into a tared glass beaker. Place the contents of the beaker in a 500 ml stoppered conical flask, add 100 ml of water and $(2 \pm 0,5)$ g of potassium iodide and stir to dissolve. Add (15 ± 1) ml of hydrochloric acid solution (diluted 1 + 1 by volume), swirl, and allow to stand for 5 min. Titrate with the sodium thiosulfate solution until the solution is pale yellow. Add (5 ± 1) ml of starch solution (5.2.1.2.4) and titrate to the end point, i.e. to the disappearance of the blue-black colour. Record the volume (V) used.

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

$$c = \frac{m}{V \times 49,0317}$$

where

m is the mass, in milligrams, of potassium dichromate ($K_2Cr_2O_7$) weighed ;

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

49,0317 is the molar mass, in grams per mole, of potassium dichromate ($\frac{1}{6} K_2Cr_2O_7$).

5.2.1.3 Apparatus

Ordinary laboratory apparatus and glassware.

5.2.1.3.1 Potentiometric titrimeter.

5.2.1.3.2 Automatic burette, volume 50 ml, equipped with an injection tip (made of brown glass).

5.2.1.3.3 Electromechanical stirrer.

5.2.1.3.4 Glass titration beaker, capacity 250 ml (made of brown glass).

5.2.1.3.5 Platinum-Ag/AgCl combination electrode with electrolytic junction with built-in diaphragm.