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Chemicals used for treatment of swimming pool water — Potassium peroxomonosulfate

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National foreword

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A list of organizations represented on this committee can be obtained on request to its secretary.

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Produits chimiques utilisés pour le traitement de l'eau des piscines - Peroxomonosulfate de potassium

Produkte zur Aufbereitung von Schwimm- und Badebeckenwasser - Kaliumperoxomonosulfat

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Foreword

This document (EN 16380:2013) 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of an identical text or by endorsement, at the latest by June 2014, and conflicting national standards shall be withdrawn at the latest by June 2014.

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Introduction

In respect of potential adverse effects on the quality of water for swimming pools, 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 for swimming pools. 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 swimming pool water treatment. It also determines the rules relating to safe handling and use (see Annex B).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12678, *Chemicals used for treatment of water intended for human consumption — Potassium peroxomonosulfate*

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

$K_5H_3S_4O_{18}$ (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 Number[1)]

70693-62-8 referring to $KHSO_5$.

1) Chemical Abstracts Service Registry Number.

3.1.7 EINECS reference[2)]

274-778-7 referring to $KHSO_5$.

3.2 Commercial form

Potassium peroxomonosulfate as a 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 a 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.

3.3.8 Viscosity (dynamic)

Not applicable.

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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

Potassium peroxomonosulfate is a powerful oxidising 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:

$$HSO_5^- + 2H^+ + 2e^- \leftrightarrow HSO_4^- + H_2O \quad (1)$$

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 swimming pools water. 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.

Users of this product should check the national regulations in order to clarify whether it is of appropriate purity for treatment of water for swimming pools, 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 % or the manufacturer’s declared values.

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

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 oxidising medium. Pesticides and polycyclic aromatic hydrocarbons are not by-products of the manufacturing process.			

5 Test methods

The sampling and the analytical methods are those described in EN 12678.

6 Labelling - Transportation - Storage

6.1 Means of delivery

Potassium peroxomonosulfate shall be delivered in polyethylene bags, with net contents of 1 kg to 50 kg or fibre drums with polyethylene linings, with net contents of 1 kg to 100 kg.

Never use paper bags.

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.

6.2 Labelling according to the EU legislation[4)]

The following labelling requirements apply to potassium peroxomonosulfate at the date of the publication of this standard:

4) See [2].

a) GHS07 **b) GHS05** **c) GHS03**

Figure 1 — Hazard pictograms

— Signal word: **Danger.**

— Hazard statements:

H302: Harmful if swallowed.

H314: Causes severe skin burns and eye damage.

H318: Causes serious eye damage.

H272: May intensify fire; Oxidiser

Precautionary statements ('P statements') should be provided by the company being responsible for the marketing of the substance. They should be indicated on the packaging label and in the extended safety data sheet (eSDS) of the substance.

The regulation [2], and its amendments for the purposes of its adaptation to technical and scientific progress, contains a list of substances classified by the EU. Substances not listed in this regulation should be classified on the basis of their intrinsic properties according to the criteria in the regulation by the person responsible for the marketing of the substance.

6.3 Transportation regulations and labelling

Potassium peroxomonosulfate is listed as UN Number[5] 3260

— RID [6]: Class 8, Classification Code C2, Packaging Group III;

— ADR [7]: Class 8, Classification Code C2, Packaging Group III;

— IMDG [8]: Class 8, Packaging Group III, EmS: F-A, S-Q;

— IATA [9]: Class 8, Packaging Group III.

6.4 Marking

The marking shall include the following:

— the name: “potassium peroxomonosulfate triple salt” and trade name;

— the net mass;

— the name and address of supplier and/or manufacturer;

— the statement “This product conforms to EN 16380, type”.

5) United Nations Number.

6) Regulations concerning International carriage of Dangerous goods by rail.

7) European Agreement concerning the international carriage of Dangerous goods by Road.

8) International Maritime transport of Dangerous Goods.

9) International Air Transport Association.

6.5 Storage

6.5.1 Generals

Store the product in original packages in a cool and dry place, away from any sources of heat or incompatible materials. For more details about use, see Annex A.

6.5.2 Long term stability

Stable for a long period of time when stored below 25 °C and under dry conditions. The active oxygen loss per month is less than mass fraction 0,5 % relative.

6.5.3 Storage incompatibilities

Avoid heat and moisture (decomposes above 60 °C).

Avoid contact with alkaline or reducing substances.

Avoid contact with oxidisable organic substances and combustible materials.

Avoid contact with metals and metal ions (e.g. Fe, Mn, Co, Ni).

Annex A
(informative)

General information on potassium peroxomonosulfate

A.1 Origin

A.1.1 Raw materials

Potassium peroxomonosulfate is manufactured from oleum (sulfuric acid + SO_3), hydrogen peroxide (H_2O_2) and potassium hydroxide (KOH).

A.1.2 Manufacturing process

Commercial product is formed from oleum and hydrogen peroxide, with subsequent partial neutralisation by potassium hydroxide.

$$SO_3 + H_2SO_4 + 2\,H_2O_2 \rightarrow 2\,H_2SO_5 + H_2O \quad \text{(A.1)}$$

$$2\,H_2SO_5 + 2\,H_2SO_4 + 5\,KOH \rightarrow 2\,KHSO_5.\,KHSO_4.\,K_2SO_4 + 5\,H_2O \quad \text{(A.2)}$$

$$SO_3 + 3\,H_2SO_4 + 2\,H_2O_2 + 5\,KOH \rightarrow 2\,KHSO_5.\,KHSO_4.\,K_2SO_4 + 6\,H_2O \quad \text{(A.3)}$$

A.2 Use

A.2.1 Function

Oxidation of oxidisable matter (organic and inorganic) in water treatment.

A.2.2 Form in which it is used

It is used as delivered, or as an aqueous solution in demineralised water, containing 20 g/l to 200 g/l of $KHSO_5$.

A.2.3 Treatment dose

Typical dose of $KHSO_5$ is 10 mg/l (g/m^3).

A.2.4 Means of application

The product is usually applied using a metering pump or directly into the swimming pool.

A.2.5 Secondary effects

Increase of the salt content of the treated water, especially potassium ions and sulfate ions.

10 mg $KHSO_5$ (which corresponds approximately to 22 mg of commercial product) corresponds to approximately 2,6 mg of K^+ and 6,3 mg of SO_4^{2-} totally.

Lowering of the pH value of the water by formation of $KHSO_4$.

A.2.6 Removal of excess product

Addition of reducing agents (for example sulfur dioxide (SO_2), sodium sulfite (Na_2SO_3)).

Annex B
(normative)

General rules relating to safety

B.1 Rules for safe handling and use

The supplier shall provide current safety instructions.

B.2 Emergency procedures

B.2.1 First aid

Skin: wash thoroughly with plenty of water and soap.

Eyes: rinse immediately and thoroughly with plenty of water for at least 15 min and seek medical advice.

Inhalation: remove person to fresh air, if breathing is difficult seek medical help immediately.

Ingestion: give plenty of water to drink. Do not induce vomiting. Seek medical advice.

B.2.2 Spillage

Sweep up and collect into dry, clean, vented plastics containers. Residues are rinsed away with water. Observe locally valid waste disposal regulations.

B.2.3 Fire

Extinguish with water or water mist.

Bibliography

[1] Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption

[2] Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (REACH)

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