BRITISH STANDARD

BS EN
885:2004

Chemicals used for treatment of water intended for human consumption — Polyaluminium chloride hydroxide silicate

The European Standard EN 885:2004 has the status of a British Standard

ICS 71.100.80

National foreword

This British Standard is the official English language version of EN 885:2004. It supersedes BS EN 885:2001 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee CII/59, Chemicals for drinking water treatment, which has the responsibility to:

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Chemicals used for treatment of water intended for human consumption - Polyaluminium chloride hydroxide silicate

Produits chimiques utilisés pour le traitement de l'eau destinée à la consommation humaine - Polyhydroxychlorosilicate d'aluminium

Produkte zur Aufbereitung von Wasser für den Menschlichen Gebrauch - Polyaluminiumhydroxidchloridsilikat

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Contents

Foreword

This document (EN 885:2004) 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of an identical text or by endorsement, at the latest by May 2005, and conflicting national standards shall be withdrawn at the latest by May 2005.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 885:2001.

Significant technical differences between this edition and EN 885:2001 are as follows:

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

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

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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 document:

a) this document 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 document 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 polyaluminium chloride hydroxide silicate used for treatment of water intended for human consumption. It describes the characteristics of polyaluminium chloride hydroxide silicate and specifies the requirements for polyaluminium chloride hydroxide silicate and refers to the corresponding analytical methods. It gives information on its use in water treatment. It also determines the rules relating to safe handling and use of polyaluminium chloride hydroxide silicate (see annex B).

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 1302, *Chemicals used for treatment of water intended for human consumption — Aluminium based coagulants — Analytical methods*.

ISO 3165, *Sampling of chemical products for industrial use — Safety in sampling.*

ISO 6206, *Chemical products for industrial use — Sampling — Vocabulary.*

3 Description

3.1 Identification

3.1.1 Chemical name

Polyaluminium chloride hydroxide silicate.

3.1.2 Synonym or common name

Polyaluminium chloride silicate.

3.1.3 Relative molecular mass

Variable (see 3.1.4).

3.1.4 Empirical formula

Polyaluminium chloride hydroxide silicate is a synthetically manufactured polymerized basified aluminium salt containing silicate. The structure of the product is polymeric.

$Al(Na)_d(OH)_a(SiOx)_cCl_b$ with $a + b + 2c\ (x - 2) = 3 + d$

and

a = 1,05 to 2,4

b = 0,5 to 3

c = 0,01 to 0,3

d = 0,005 to 2

$x \geq 2$

3.1.5 Chemical formula

Variable (see 3.1.4).

3.1.6 CAS Registry Number[1)]

Aluminium chloride hydroxide silicate: 94894-80-1.

3.1.7 EINECS reference[2)]

The following is a list of EINECS reference numbers for products or their starting materials.

Aluminium hydroxide chloride: 215-477-2.

Aluminosilicate: 215-475-1.

Sodium chloride: 231-598-3.

3.2 Commercial form

The product is available as a liquid.

3.3 Physical properties

3.3.1 Appearance

Polyaluminium chloride hydroxide silicate is a colourless to yellow, clear liquid.

3.3.2 Density

The density depends on the particular composition, especially the aluminium ion content, expressed as a mass fraction of aluminium (Al) in %.

Typical values are 1,20 g/ml to 1,25 g/ml for 5,3 % Al.

3.3.3 Solubility in water

Polyaluminium chloride hydroxide silicate is fully miscible with water.

NOTE Depending on the particular product, dilute solutions can hydrolyse and form a precipitate.

3.3.4 Vapour pressure at 20 °C

Not known.

3.3.5 Boiling point at 100 kPa[3)]

100 °C.

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1) Chemical Abstracts Service Registry Number.

2) European Inventory of Existing Commercial Chemical Substances.

3) 100 kPa = 1 bar.

3.3.6 Crystallization point

Typical value is - 10 °C for 5,3 % Al.

3.3.7 Specific heat

Not known.

3.3.8 Viscosity (dynamic)

Typical value is 15 mPa.s for 5,3 %Al at 20 °C.

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

Polyaluminium chloride hydroxide silicate is an acidic liquid which hydrolyses and forms a precipitate of aluminium hydroxide when diluted beyond a particular concentration.

NOTE Since aluminium compounds are amphoteric in nature, the solubility of aluminium depends on the pH value and the product should be used within an appropriate pH range.

4 Purity criteria

4.1 General

This document specifies the minimum purity requirements for polyaluminium chloride hydroxide silicate 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 the 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 document.

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 in the production process or raw materials lead 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 concentration of active matter (aluminium ion content) in the commercial product expressed as grams per kilogram of product shall be not less than 50 g/kg.

The content of aluminium shall be within ± 3 % of the manufacturer's declared value.

The relative basicity expressed as the mole ratio OH/3Al shall be greater than 0,35.

4.3 Impurities and main by-products

The content of insoluble matters shall not exceed 25 g/kg of Al.

4.4 Chemical parameters

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

Table 1 — Chemical parameters

Parameter		Limit (mg/kg of Al)		
		type 1	type 2	type 3
Arsenic (As)	max.	14	40	100
Cadmium (Cd)	max.	3	50	100
Chromium (Cr)	max.	30	700	1 000
Mercury (Hg)	max.	4	10	20
Nickel (Ni)	max.	20	700	1 000
Lead (Pb)	max.	40	200	800
Antimony (Sb)	max.	20	40	120
Selenium (Se)	max.	20	40	120
NOTE Cyanide (CN^-) is usually not relevant because of the acidity of the product. 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 the product on trace metal content in drinking water see A.2.				

5 Test methods

5.1 Sampling

5.1.1 General

Observe the general rules of ISO 3165 and take into account ISO 6206

5.1.2 Sampling from drums and bottles

5.1.2.1 General

5.1.2.1.1 Mix the contents of each container to be sampled by shaking the container, by rolling it or by rocking it from side to side, taking care not to damage the container or spill any of the liquid.

5.1.2.1.2 If the design of the container is such (for example, a narrow-necked bottle) that it is impracticable to use a sampling implement, take a sample by pouring after the contents have been thoroughly mixed. Otherwise, proceed as described in 5.1.2.3.

5.1.2.1.3 Examine the surface of the liquid. If there are signs of surface contamination, take samples from the surface as described in 5.1.2.2; otherwise, take samples as described in 5.1.2.3.

5.1.2.2 Surface sampling

Take a sample using a suitable ladle. Lower the ladle into the liquid until the rim is just below the surface, so that the surface layer runs into it. Withdraw the ladle just before it fills completely and allow any liquid adhering to the ladle to drain off. If necessary, repeat this operation so that, when the other selected containers have been sampled in a similar manner, the total volume of sample required for subsequent analysis is obtained.

5.1.2.3 Bottom sampling

Take a sample using an open sampling tube, or a bottom-valve sampling tube, suited to the size of container and the viscosity of the liquid.

When using an open sampling tube, close it at the top and then lower the bottom end to the bottom of the container. Open the tube and move it rapidly so that the bottom of the tube traverses the bottom of the container before the tube is filled. Close the tube, withdraw it from the container and allow any liquid adhering to the outside of the tube to drain off.

When using a bottom-valve sampling tube, close the valve before lowering the tube into the container and then proceed in a similar manner to that when using an open sampling tube.

5.1.3 Sampling from tanks and tankers

From each access point, take samples as follows:

a) from the surface of the liquid, using a ladle as described in 5.1.2.2;

b) from the bottom of the tank or tanker, using a sampling tube as described in 5.1.2.3 or using specially designed bottom-sampling apparatus;

c) from one or more positions, depending on the overall depth, between the bottom and the surface using a weighted sampling can.

5.2 Analyses

Use the relevant methods for analysis described in EN 1302.

6 Labelling - Transportation - Storage

6.1 Means of delivery

The product shall be delivered in tankers of corrosion-resistant materials suitable for the purpose.

NOTE The manufacturer can provide advice on suitable materials.

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 Risk and safety labelling according to the EU-Directives[4)]

One of the two following labelling requirements shall apply to polyaluminium chloride hydroxide silicate at the date of the publication of this document and depending on the relative basicity, composition and concentration:

NOTE Annex I of the Directive 67/548/EEC on Classification, packaging and labelling of dangerous substances and its amendments and adaptations in the European Union contains a list of substances classified by the EU. Substances not in this annex I should be classified on the basis of their intrinsic properties according to the criteria in the Directive by the person responsible for the marketing of the substance.

a)

- symbols and indications of danger:
  - Xi: irritant;
- nature of special risks attributed to dangerous substances:
  - R 36/38: Irritating to eyes and skin;
- safety advice concerning dangerous substances:
  - S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice;
  - S 28: After contact with skin, wash immediately with plenty of water;

b)

- symbols and indications of danger:
  - C: Corrosive;
- nature of special risks attributed to dangerous substances :
  - R 34: Causes burns;
- safety advice concerning dangerous substances:
  - S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice;
  - S 27: Take off immediately all contaminated clothing;
  - S 37/39: Wear suitable gloves and eye/face protection.

4) See ([2]).

6.3 Transportation regulations and labelling

Depending on the composition, the commercial product can be subject to transportation regulations and, if so, polyaluminium chloride hydroxide silicate is listed as UN number[5] 1760 (corrosive liquid not otherwise specified):

— RID[6]: class 8, classification code C9;packing group I;

— ADR[7]: class 8, classification code C9; packing group I;

— IMDG[8]: class 8;

— IATA[9]: class 8.

6.4 Marking

The marking shall include the following information:

— the name "Polyaluminium chloride hydroxide silicate", trade name, grade and type;

— the net mass;

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

— the statement "This product conforms to EN 885".

6.5 Storage

6.5.1 General

Storage tanks shall be of corrosion resistant material suitable for the purpose.

NOTE 1 The manufacturer can provide advice on suitable materials.

NOTE 2 Storage tanks located outside can require protection against extreme temperature, depending on freezing point and maximum storage temperature: refer to manufacturer's information on permissible temperatures.

6.5.2 Long term stability

Polyaluminium chloride hydroxide silicate is usually stable.

6.5.3 Storage incompatibilities

Avoid contact with chlorites, hypochlorites and sulfites.

The product reacts aggressively with some metal surfaces (e.g. galvanized metal, aluminium, copper, zinc and alloys of these metals).

The product is incompatible with iron salts and aluminium sulfate.

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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.

Annex A
(informative)

General information on polyaluminium chloride hydroxide silicate

A.1 Origin

A.1.1 Raw materials

Depending on product and manufacturer, the polyaluminium chloride hydroxide silicate is manufactured from:

— aluminium hydroxide;

— aluminium chloride;

— aluminium metal;

— bauxite or clay;

— sodium silicate;

— silica;

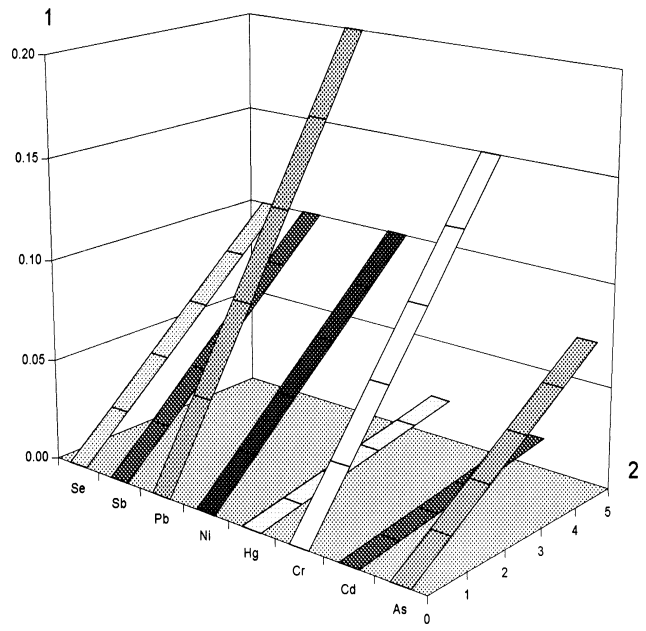
— hydrochloric acid.

A.1.2 Manufacturing process

A typical manufacturing process is the reaction of a raw material containing aluminium or aluminium compounds with hydrochloric acid, with or without the addition of aluminium chloride, with the addition of silica in a substoichiometric amount of acidic material.

A.2 Quality of commercial product

The three types of polyaluminium chloride hydroxide silicate specified in Table 1 reflect the quality of commercially available products. Figures A.1 to A.3 show the maximum concentrations of trace metals that would be added to the raw water by the addition of products corresponding to the purity levels specified in Table 1. It can be seen that the concentrations of metal added are well below the Parametric Values given in the EU Directive 98/83/EC (see [1]) at typical product doses. Furthermore, the figures overstate the concentrations of metals that would be present in the treated water since a substantial proportion of the trace metals will be incorporated in the sludge. Users of this product should select an appropriate grade and type to enable them to achieve treated water quality targets taking into account raw water characteristics, required dosage, process plant conditions and other relevant factors.

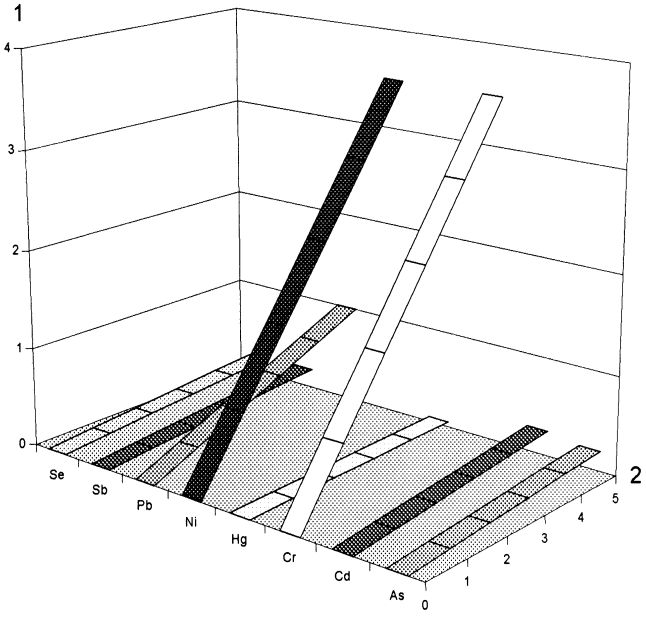


A	B
As	10
Cd	5
Cr	50
Hg	1
Ni	20
Pb	10
Sb	5
Se	10

Key

1 Maximum addition to water µg/l metal
2 Product dosage mg/l Al - Typical dose
A Element
B Drinking water limit µg/l

Figure A.1 — Maximum impact of polyaluminium chloride hydroxide silicate, type 1, on trace metal content of water

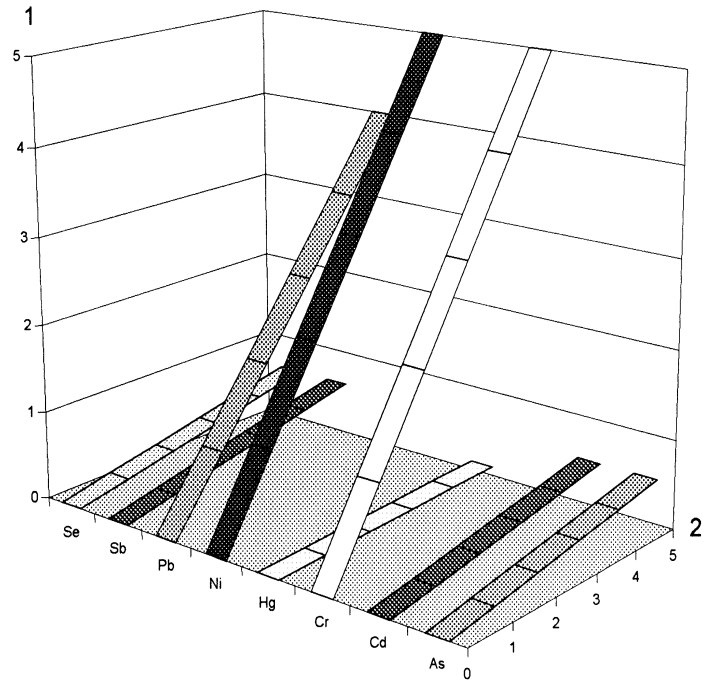


A	B
As	10
Cd	5
Cr	50
Hg	1
Ni	20
Pb	10
Sb	5
Se	10

Key

1 Maximum addition to water µg/l metal
2 Product dosage mg/l Al - Typical dose
A Element
B Drinking water limit µg/l

Figure A.2 — Maximum impact of polyaluminium chloride hydroxide silicate, type 2, on trace metal content of water



A	B
As	10
Cd	5
Cr	50
Hg	1
Ni	20
Pb	10
Sb	5
Se	10

Key

1 Maximum addition to water µg/l metal
2 Product dosage mg/l Al - Typical dose
A Element
B Drinking water limit µg/l

Figure A.3 — Maximum impact of polyaluminium chloride hydroxide silicate, type 3, on trace metal content of water

A.3 Use

A.3.1 Function

The product is used as a coagulant, and sometimes simultaneously as a precipitant.

A.3.2 Form in which it is used

The product is used as delivered or according to the manufacturer's recommendations.

A.3.3 Treatment dose

The treatment dose is generally in the range of 1 mg/l to 15 mg/l expressed as Al, depending on raw water quality.

A.3.4 Means of application

The product is usually applied using a positive-displacement metering pump. Sufficient turbulence should be provided at the point of addition to promote rapid dispersion.

A.3.5 Secondary effects

— Reduction of pH value and alkalinity;

— increase of respective anion concentration.

A.3.6 Removal of excess product

The water purification process should be operated under conditions (e.g. pH) in which aluminium ions in the system are precipitated and reduced below the maximum allowable concentration.

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

In case of contact with skin, take off immediately contaminated clothing, wash thoroughly with cold water and seek medical advice if irritation persists.

In case of contact with eyes, rinse thoroughly with cold water and seek medical advice.

In case of ingestion, seek medical advice immediately.

B.2.2 Spillage

Put on protective clothing. Collect and dispose of spillages carefully.

NOTE Local regulations might apply to the disposal of this product.

B.2.3 Fire

The product is a non-flammable liquid. Any extinguishing media can be used. The product can liberate hydrogen chloride when boiled to dryness or heated above 200 °C.

Bibliography

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

[2] 67/548/EEC, *Council Directive of 27th June 1967 on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances and its amendments and adaptations.*

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