BS EN 1421:2012

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Chemicals used for treatment of water intended for human consumption — Ammonium chloride

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee CII/59, Chemicals for drinking water treatment.

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

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Chemicals used for treatment of water intended for human consumption - Ammonium chloride

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

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Ammoniumchlorid

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Foreword

This document (EN 1421:2012) 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of an identical text or by endorsement, at the latest by May 2013, and conflicting national standards shall be withdrawn at the latest by May 2013.

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 1421:2005.

The significant technical differences between this edition and EN 1421:2005 are as follows:

— Modification of 6.2 on labelling, deletion of the reference to EU Directive 80/778/EEC of 15 July 1980 in order to take account of the latest Directive in force.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey 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 ammonium chloride used for treatment of water intended for human consumption. It describes the characteristics and specifies the requirements of ammonium chloride and refers to the corresponding analytical methods. It gives information for its use in water treatment. It also determines the rules relating to safe handling and use of ammonium chloride (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 1233, *Water quality — Determination of chromium — Atomic absorption spectrometric methods*

EN ISO 3696, *Water for analytical laboratory use — Specification and test methods* (ISO 3696)

EN ISO 11885, *Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885)*

EN ISO 11969, *Water quality — Determination of arsenic — Atomic absorption spectrometric method (hydride technique (ISO 11969)*

EN ISO 12846, *Water quality — Determination of mercury — Method using atomic absorption spectrometry (AAS) with and without enrichment (ISO 12846)*

ISO 2762,*Hydrochloric acid for industrial use — Determination of soluble sulfates — Turbidimetric method*

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

ISO 3332, *Ammonium sulphate for industrial use — Determination of ammoniacal nitrogen content — Titrimetric method after distillation*

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

ISO 6332, *Water quality — Determination of iron — Spectrometric method using 1,10-phenanthroline*

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*

ISO 9965, *Water quality — Determination of selenium — Atomic absorption spectrometric method (hydride technique)*

3 Description

3.1 Identification

3.1.1 Chemical name

Ammonium chloride.

3.1.2 Synonym or common name

Sal-ammoniac.

3.1.3 Relative molecular mass

53,5.

3.1.4 Empirical formula

NH_4Cl.

3.1.5 Chemical formula

NH_4Cl.

3.1.6 CAS Registry Number [1)]

12125-02-9.

3.1.7 EINECS reference [2)]

235-186-4.

3.2 Commercial form

Ammonium chloride is available as a powder.

3.3 Physical properties

3.3.1 Appearance and odour

The product is a white powder or white crystals, without any odour.

3.3.2 Density

The density of the product is 1,53 g/cm^3 at 20 °C.

The bulk density is 0,6 g/cm^3 to 1 g/cm^3 depending on particle size.

3.3.3 Solubility in water

The solubility of the product in water at 20 °C is 374 g/l.

The solubility of the product in water at 50 °C is 504 g/l.

NOTE Dissolution of NH_4Cl in water is a strongly endothermic reaction and the resulting decrease in temperature can lead to crystallisation.

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1) Chemical Abstracts Service Registry Number.

2) European Inventory of Existing Commercial Chemical Substances.

3.3.4 Vapour pressure

100 Pa at 160 °C.

3.3.5 Boiling point at 100 kPa [3)]

Not applicable.

3.3.6 Melting point

Sublimation at 338 °C.

3.3.7 Specific heat

Not known.

3.3.8 Viscosity

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

The pH value of an aqueous solution of mass fraction of 5 % is 4 to 6.

Ammonium chloride attacks metals, e.g. iron, copper, nickel, zinc.

Reaction with strong acids can generate hydrochloric acid gas; reaction with strong alkalis can generate ammonia gas.

4 Purity criteria

4.1 General

This European Standard specifies the minimum purity requirements for ammonium chloride 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.

3) 100 kPa = 1 bar.

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 this product standard.

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 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 content of ammonium chloride (NH_4Cl) shall not be less than a mass fraction of 99 %.

4.3 Impurities and main by-products

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

Table 1 — Impurities

Impurity		Limit (mg/kg) of the product
Sulfate (SO_4^{2-})	max	100
Iron (Fe)	max	5

4.4 Chemical parameters

The product shall conform to the requirements specified in Table 2.

Table 2 — Chemical parameters

Parameter		Limit (mg/kg) of the product
Antimony (Sb)	max	1
Arsenic (As)	max	5
Cadmium (Cd)	max	0,5
Chromium (Cr)	max	5
Lead (Pb)	max	5
Mercury (Hg)	max	0,1
Nickel (Ni)	max	5
Selenium (Se)	max	1

NOTE Pesticides and polycyclic aromatic hydrocarbons and cyanides (CN) are not relevant in ammonium chloride because the raw materials used in the manufacturing process are free of them. For parametric values of ammonium chloride on trace metal content in drinking water, see [1].

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 Analyses

5.2.1 Main product

The determination of the ammoniacal nitrogen by titration after distillation is carried out in accordance with ISO 3332.

5.2.2 Impurities

5.2.2.1 Iron (Fe)

The iron content shall be determined in accordance with ISO 6332.

5.2.2.2 Sulfate

The sulfate (SO_4^{2-}) content shall be determined in accordance with ISO 2762.

5.2.3 Chemical parameters

5.2.3.1 Determination of antimony (Sb), arsenic (As), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), nickel (Ni) and selenium (Se)

5.2.3.1.1 Principle

The elements antimony, arsenic, cadmium, chromium, lead, mercury, nickel and selenium are determined by atomic absorption spectrometry.

5.2.3.1.2 Reagents

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

5.2.3.1.2.1 Hydrochloric acid, concentrated density ρ = 1,18 g/ml.

5.2.3.1.3 Procedure

5.2.3.1.3.1 Test portion

Weigh, to the nearest 0,001 g, 2,5 g (*m*) from the laboratory sample into a 100 ml one-mark volumetric flask.

5.2.3.1.3.2 Test solution

Add 20 ml of water and 2 ml of the hydrochloric acid (5.2.3.1.2.1), dissolve and make up to the mark with water and mix.

5.2.3.1.3.3 Determination

Determine the content of chemical parameters in the test solution (5.2.3.1.3.2) in accordance with the following methods:

— Ni, Pb and Cd: in accordance with ISO 8288:1986, method A;

— Cr: in accordance with EN 1233;

— As: in accordance with EN ISO 11969;

— Se: in accordance with ISO 9965;

— Sb: in accordance with EN ISO 11885;

— Hg: in accordance with EN ISO 12846.

These methods are providing an interim result (y) expressed in milligrams per litre which needs to be converted to give the final concentration according to the formula in 5.2.3.1.3.4.

5.2.3.1.3.4 Expression of results

From the interim result (y) determined (see 5.2.3.1.3.3), the content, C, of each chemical parameter in the laboratory sample, expressed in milligrams per kilogram of ammonium chloride is given by the following formula.

$$C = \frac{y \times V \times 100}{m} \quad (1)$$

where

y is the interim result (5.2.3.1.3.3);

V is the volume, expressed in millilitres, of the test solution (5.2.3.1.3.2) (= 100 ml);

m is the mass, expressed in grams, of the test portion.

6 Labelling – Transportation – Storage

6.1 Means of delivery

Ammonium chloride shall be delivered in paper bags with polyethylene liners, polyethylene or polypropylene 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 ammonium chloride at the date of publication of this European Standard:

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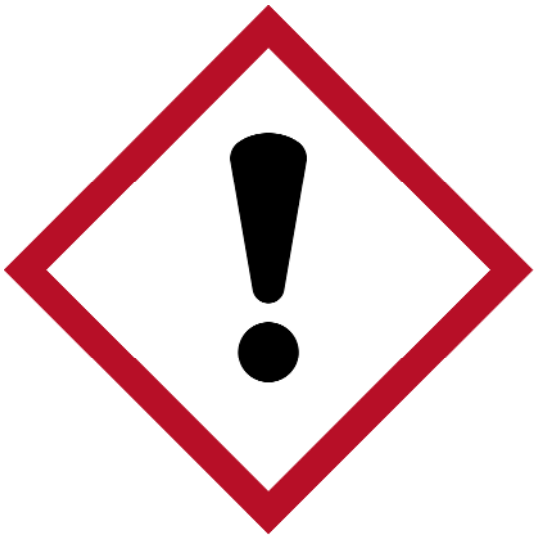
4) See [2].

Hazard pictogram



GHS07

— Signal word: **Warning**

— Hazard statements:

H302: Harmful if swallowed

H319: Causes serious eye irritation

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 legislation [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

Ammonium chloride is not classified as a dangerous product for road, rail, sea and air transportation.

6.4 Marking

The marking shall include the following:

— name "ammonium chloride", trade name and grade;

— net mass;

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

— statement "this product conforms to EN 1421".

6.5 Storage

6.5.1 Long term stability

Product is stable but hygroscopic.

6.5.2 Storage incompatibilities

The product shall be kept away from strong acids or strong alkalis and from moisture.

The product shall be kept away from electrical equipment.

Annex A
(informative)

General information on ammonium chloride

A.1 Origin

A.1.1 Raw materials

Ammonium chloride is manufactured from hydrochloric acid (HCl) and ammonia (NH_3).

A.1.2 Manufacturing process

Ammonium chloride is produced either by direct reaction between HCl and NH_3, or as a by-product of the ammonia-soda process.

A.2 Use

A.2.1 Function

Ammonium chloride is used for the in-situ formation of chloramines by the reaction of chlorine and ammonium chloride.

A.2.2 Form in which it is used

Ammonium chloride is used as an aqueous solution.

A.2.3 Treatment dose

The treatment dose is such that the ammonia (NH_3) content is 0,5 mg/l.

A.2.4 Means of application

The product is applied using a metering pump.

A.2.5 Secondary effects

The use of the product will increase the chloride content of the treated water.

A.2.6 Removal of excess product

Not applicable.

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 the skin, remove any contaminated clothing and wash the skin with plenty of water.

In case of contact with the eyes, rinse immediately with plenty of water.

In case of inhalation, remove the victim to fresh air.

In case of ingestion, rinse the mouth with water and consult a doctor.

B.2.2 Spillage

Place the spilled material into a dry container avoiding dust formation and rinse the area with plenty of water.

B.2.3 Fire

The product is not combustible.

Bibliography

[1] 98/83/EC, Council Directive 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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