BS EN 14369:2015

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Products used for treatment of water intended for human consumption - Iron-coated granular activated alumina

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National foreword

This British Standard is the UK implementation of EN 14369:2015. It supersedes BS EN 14369:2003 which is withdrawn.

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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English Version

Products used for treatment of water intended for human consumption - Iron-coated granular activated alumina

Produits utilisés pour le traitement de l'eau destinée à la consommation humaine - Alumine active en grains revêtue de fer

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Eisenumlagertes granuliertes aktiviertes Aluminiumoxid

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Contents

Foreword

This document (EN 14369:2015) 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of an identical text or by endorsement, at the latest by October 2015, and conflicting national standards shall be withdrawn at the latest by October 2015.

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 14369:2003.

The main technical difference between this edition and EN 14369:2003 is the updating of 9.2 in line with current legislation.

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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 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 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 iron-coated granular activated alumina used for treatment of water intended for human consumption. It describes the characteristics of iron-coated granular activated alumina and specifies the requirements and the corresponding test methods for iron-coated granular activated alumina. It gives information on its use in water treatment.

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 12901:1999, *Products used for treatment of water intended for human consumption — Inorganic supporting and filtering materials — Definitions*

EN 12902, *Products used for treatment of water intended for human consumption — Inorganic supporting and filtering materials — Methods of test*

ISO 9277, *Determination of the specific surface area of solids by gas adsorption — BET method*

3 Terms, definitions and symbols

For the purposes of this document, the terms, definitions and symbols given in EN 12901:1999 apply.

4 Description

4.1 Identification

4.1.1 Chemical name

Aluminium oxide (partially hydroxylated) coated with iron.

4.1.2 Synonym or common name

None.

4.1.3 Chemical formula

$Al_2O_{(3-x)}(OH)_{2x} + Fe(OH)_3$ x ranges from almost zero to 0,80.

4.1.4 CAS Registry number[1)]

Activated alumina: 1344-28-1.

Iron(III) sulfate: 10028-22-5.

[1)] Chemical Abstracts Service Registry Number.

4.1.5 EINECS reference[2)]

Activated alumina: 215-691-6.

Iron(III) sulfate: 233-072-9.

4.2 Commercial form

Iron-coated activated alumina is a granular product consisting of irregularly shaped (non-moulded) particles; the product is available in different particle sizes.

5 Physical properties

5.1 Appearance

The product consists of brown particles of irregular shape. The product shall be generally homogeneous and shall be visibly free of extraneous matter.

5.2 Particle size distribution

The particle size distribution shall be described by either;

a)

— effective size (d_{10}) with a maximum deviation of ± 5 %;

— uniformity coefficient (U) less than 1,5;

— minimum size (d_1) with a maximum deviation of ± 5 %.

or

b) particle size range and mass fraction of oversize and undersize particles; see A.2.2.1.

The proportion of oversize plus undersize particles shall not exceed a mass fraction of 15 % and not more than a mass fraction of 5 % shall be undersized.

NOTE 1 The particle size can decrease during transportation and handling.

NOTE 2 Other values can be necessary for certain applications.

5.3 Bulk density packed

The bulk density (packed) shall be greater than 600 kg/m^3.

6 Chemical properties

This European Standard specifies the minimum purity requirements for iron-coated granular activated alumina 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.

2) European Inventory of Existing Commercial Chemical Substances.

Users of this product should satisfy themselves that it is of appropriate purity for treatment of water intended for human consumption, taking into account raw water quality, contents of other impurities and additives used in the products not stated in the product standard, and other relevant factors.

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 lead to significant quantities of impurities, by-products or additives being present, this shall be notified to the user.

After filling, washing and commissioning of a filter system producing drinking water, iron-coated activated alumina should not increase the concentrations of chemical parameters (see [1]).

NOTE Water extractable substances, determined in accordance with the method for granular materials given in EN 12902, can be used to estimate the leaching of the chemicals specified in EN 12902.

7 Specific properties

The surface area shall be not less than 200 m^2/g.

8 Test methods

8.1 Sampling

Prepare the laboratory sample required by the relevant procedures described in EN 12902.

8.2 Analysis

8.2.1 Particle size distribution

The particle size distribution shall be determined on samples taken at the point of manufacture using the method of test given in EN 12902.

8.2.2 Bulk density packed

The bulk density packed shall be determined in accordance with EN 12902.

8.2.3 Surface area

The surface area shall be determined by the BET method, degassing at a maximum of 200 °C, in accordance with ISO 9277.

9 Labelling, transportation and storage

9.1 Means of delivery

Iron-coated granular activated alumina shall be delivered in bulk (dry or wet product), in semi-bulk containers or in drums of cardboard, plastics or steel or suitable bags of various sizes.

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.

9.2 Labelling according to the EU legislation

Iron-coated granular activated alumina is not listed within Annex VI of Regulation (EC) No 1272/2008 at the date of publication of this European Standard.

The legislation [2] 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.

9.3 Transportation regulations and labelling

Iron-coated granular activated alumina is not classified as dangerous for transportation by road, rail, sea or air. Iron-coated granular activated alumina is not listed under a UN number[3)].

9.4 Marking

The marking shall include the following:

— name “Iron-coated Granular Activated Alumina”, trade name and grade;

— net mass;

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

— statement “This product conforms to EN 14369”.

9.5 Storage

9.5.1 Long term chemical stability

The product is stable and can be stored for a period of at least two years.

9.5.2 Storage incompatibilities

Keep away from moisture, strong acids or strong alkalis, solvents and odorous products.

3) United Nations number.

Annex A
(informative)

General information on iron-coated granular activated alumina

A.1 Origin

A.1.1 Raw materials

Granular activated alumina is produced from aluminium hydroxide. Following manufacture of the high surface area granular activated alumina, conforming to EN 13753 (see [3]), is coated with iron using iron(III) sulfate conforming to EN 890 (see [4]).

A.1.2 Manufacturing process

Activated alumina is prepared by the calcination of aluminium hydroxide. Granular activated alumina can be prepared by granulation of activated alumina powder or calcination of aluminium hydroxide granules. Iron-coated activated alumina is prepared by coating of granules of activated alumina with insoluble iron using a solution of iron(III) sulfate.

A.2 Typical properties

A.2.1 Chemical composition

Activated alumina is a partially calcined aluminium trihydroxide with a combined water content of mass fraction between 5 % and 6 %. The crystal structure is predominantly gamma or chi alumina; small amounts of other forms can be present. The crystal structure can be determined by X-ray diffraction. The chemical composition depends on the origin of the raw material. Typical limits are given in Table A.1, the remainder being Al_2O_3.

Table A.1 — Typical chemical composition of iron-coated granular activated alumina

Parameter	Mass fraction of the product, %
Water (loss on ignition)	≤ 17
Na_2O	≤ 0,5
Fe_2O_3	≤ 6
SiO_2	≤ 0,02
TiO_2	≤ 0,002

A.2.2 Physical properties

A.2.2.1 Particle size range

Examples of particle size ranges are 1,4 mm to 2,0 mm and 2,0 mm to 4,74 mm.

A.2.2.2 Density

The absolute density of iron-coated granular activated alumina is 3,2 g/cm^3; the bulk density can vary with the particle size range.

A.2.2.3 Adsorption properties

Iron-coated granular activated alumina removes contaminants from water by adsorption. A number of indices are used as surrogates for or measures of the adsorptive capacity of iron-coated granular activated alumina under specific conditions, including specific surface area (BET isotherm).

Specifications for such properties can be the subject of agreement between the customer and the manufacturer/ supplier and the latter should make the test methods available, if requested.

A.3 Hydraulic characteristics

A.3.1 Headloss in filtration

Headloss depends on size, shape and roughness of particles, filtration rate, filter bed depth, packing characteristics and water temperature.

A.3.2 Expansion during upflow washing

The bed expansion depends on flow rate, effective size, density and shape of particles, packing characteristics and water temperature.

A.4 Use

A.4.1 Function

The primary function of iron-coated granular activated alumina is as an adsorbent for the removal of inorganic ions: particularly fluoride, arsenate and polar organic contaminants.

If iron-coated granular activated alumina is used as a filter medium for removal of suspended solids, specific tests related to the performance of filter media might have to be carried out.

Iron-coated granular activated alumina is also used as a carrier for catalysts.

A.4.2 Treatment dose

The capacity of iron-coated granular activated alumina (X) is usually expressed as mass of impurity removed by mass of iron-coated granular activated alumina. The effective dose (E), in grams per litre, of iron-coated granular activated alumina can be calculated from the following formula:

$$E = \frac{C}{X} \qquad \text{(A.1)}$$

where

C is the concentration of dissolved impurities in the raw water, in milligrams per litre;

X is the capacity, in milligrams per gram.

Both contact time and bed life depend on water quality and treatment objectives.

A.4.3 Method of use

Iron-coated granular activated alumina is used either in purpose built adsorbers or in existing filters. Precise details of use depend on the impurity to be removed and the water quality. In use, water flows through the bed and dissolved impurities are removed by adsorption and/or ion exchange at the iron-coated granular activated alumina surface. Once the concentration of impurities to be removed reaches some predetermined level, or after a predetermined time, the iron-coated granular activated alumina is replaced with fresh material.

Physical filtration of suspended solids also occurs; trapped solids and dust from initial handling can be removed by backwashing.

A.5 Rules for safe handling and use

It is recommended to handle the product so as to avoid dust formation.

A.6 Emergency procedures

A.6.1 First aid

In case of contact with skin, it is recommended to wash with soap and water.

In case of contact with eyes, it is recommended to flush with plenty of water for 15 min.

In case of inhalation, it is recommended to move to fresh air.

A.6.2 Spillage

It is recommended to sweep or to vacuum unused product and to discard in a refuse container.

A.6.3 Fire

Extinguishing media: no restrictions in fire situations.

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

[3] EN 13753, *Products used for treatment of water intended for human consumption — Granular activated alumina*

[4] EN 890, *Chemicals used for treatment of water intended for human consumption — Iron (III) sulfate solution*

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