BS EN 15029:2012

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Products used for treatment of water intended for human consumption — Iron (III) hydroxide oxide

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National foreword

This British Standard is the UK implementation of EN 15029:2012. It supersedes BS EN 15029:2006 which is withdrawn.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.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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English Version

Products used for treatment of water intended for human consumption - Iron (III) hydroxide oxide

Produits utilisés pour le traitement de l'eau destinée à la consommation humaine - Oxyde hydroxyde de fer (III)

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Eisen(III)hydroxidoxid

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Foreword

This document (EN 15029:2012) 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of an identical text or by endorsement, at the latest by May 2013, and conflicting national standards shall be withdrawn at the latest by May 2013.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 15029:2006.

The significant technical difference between this edition and EN 15029:2006 is as follows:

— 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 the 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 iron (III) hydroxide oxide used for the treatment of water intended for human consumption. It describes the characteristics of iron (III) hydroxide oxide and specifies the requirements and the corresponding test methods for iron (III) hydroxide oxide. 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(s)

Iron (III) hydroxide, iron hydroxide oxide.

4.1.2 Synonym or common names

Granular ferric hydroxide, granulated iron oxide, granulated iron oxide hydroxide, synthetic iron oxide, synthetic iron oxide hydroxide, Goethite, Akaganeite.

4.1.3 Chemical formula

$Fe(OH)_3$, FeOOH.

4.1.4 CAS Registry Number [1)]

Iron hydroxide oxide: 51274-00-1.

1) Chemical Abstracts Service Registry Number.

4.1.5 EINECS Reference [2)]

Iron hydroxide oxide: 257-098-5.

4.2 Commercial form

Iron (III) hydroxide oxide is a granular product consisting of irregularly shaped (non-moulded) particles; the product is available in different particle sizes. The water content is a mass fraction of up to 50 %.

5 Physical properties

5.1 Appearance

The product consists of black to brown granular material with 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 2,1;

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 20 % and not more than a mass fraction of 10 % 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 Density

The bulk density (loose) shall be within ± 10 % of the value specified by the manufacturer or supplier.

The bed density (backwashed and drained) should be in the range of 500 kg/m^3 to 1 800 kg/m^3.

6 Chemical properties

This European Standard specifies the minimum purity requirements for iron (III) hydroxide oxide 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 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, contents of other impurities and additives used in the products 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 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 (III) hydroxide oxide 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 100 m^2/g.

8 Test methods

8.1 Sampling

Prepare the laboratory sample(s) 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 in accordance with the method of test given EN 12902, using wet sieving.

8.2.2 Bulk density loose

The bulk density loose shall be determined in accordance with EN 12902, without drying the sample, which could lead to a reduced volume.

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 (III) hydroxide oxide shall be delivered in bulk, in semi-bulk containers, big bags or in drums of plastics-lined cardboard, plastics or steel or suitable bags of various sizes.

NOTE In case of dry iron (III) hydroxide oxide, cardboard drums without plastics-lining can be used.

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 EU legislation [3)]

Iron (III) hydroxide oxide is not listed in Annex VI of Regulation (EC) No 1272/2008 at the date of publication of this European Standard.

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.

9.3 Transportation regulations and labelling

Iron (III) hydroxide oxide is not listed under a UN [4)] number.

Iron (III) hydroxide oxide is not classified as a dangerous product for road, rail, sea and air transportation.

9.4 Marking

The marking shall include the following:

— name “Iron (III) hydroxide oxide”, trade name and commercial grade;

— net mass;

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

— statement “This product conforms to EN 15029.”

9.5 Storage

9.5.1 Long-term chemical stability

The product is stable and can be stored for a period of at least one year.

9.5.2 Storage incompatibilities

The product shall be kept away from strong acids, oxidants, solvents and odorous products.

3) See [2].

4) United Nations Number.

Annex A
(informative)

General information on iron (III) hydroxide oxide

A.1 Origin

A.1.1 Raw materials

The raw material for iron (III) hydroxide oxide is a synthesised iron (III) hydroxide.

A.1.2 Manufacturing process

Iron (III) hydroxide oxide is prepared from iron containing solutions. The granulation includes the application of high pressure such that water is separated to form a product with high porosity and specific surface area.

A.2 Typical properties

A.2.1 Chemical composition

The products covered by this European Standard contain pure iron compounds and have a water content up to 50 % mass fraction. The structure can be determined by means of X-ray diffractometry.

The chemical composition is relatively constant. The product typically contains a mass fraction of 61 % Fe, based on dried material. Typical and maximum concentrations of trace metals are given in Table A.1.

Table A.1 — Trace metals concentrations [a]

Element		**Maximum mg/kg**	**Typical mg/kg**
Arsenic	As	20	<10
Cadmium	Cd	5	<5
Lead	Pb	40	<10
Copper	Cu	100	30
Chromium	Cr	250	100
Nickel	Ni	250	100
Zinc	Zn	250	100
Manganese	Mn	3 000	1 500
[a] Values are for dried material.			

A.2.2 Physical properties

A.2.2.1 Particle size range

An example of particle size range is 0,3 mm to 2,0 mm.

NOTE Depending on the application, other particle size distributions can be used.

A.2.2.2 Density

The absolute density of iron (III) hydroxide oxide is 1,55 g/cm^3 to 1,8 g/cm^3; the bulk density (loose and packed) can vary with the particle size range.

A.2.2.3 Adsorption properties

Iron (III) hydroxide oxide removes contaminants from water by adsorption. A number of indices are used as surrogates for or measures of the adsorptive capacity of iron (III) hydroxide oxide 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 Head loss during filtration

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

A.3.2 Expansion during up-flow washing

Bed expansion depends on flow rate, effective size, density, shape and roughness of particles, and water temperature.

A.4 Use

A.4.1 Function

The primary function of iron (III) hydroxide oxide is as an adsorbent for the removal of inorganic ions; particularly arsenite, arsenate, phosphate, antimony compounds, other trace metals and polar organic contaminants. If iron (III) hydroxide oxide is used as filter media for removal of suspended solids, specific tests related to the performance of filter media might need to be carried out.

The secondary function of iron (III) hydroxide oxide is as a flocculant for the water treatment.

A.4.2 Treatment dose

The adsorption capacity is usually expressed as the mass of the removed substance per mass of adsorbent. The bed life or treatment capacity is usually expressed as volume of treated water per volume of adsorbent.

Both optimized contact time and bed life depend on raw water quality and operating conditions. During removal of arsenate from water, the specific bed life has been between 20 000 and more than 300 000 bed volumes.

A.4.3 Method of use

Iron (III) hydroxide oxide is used either in purpose built adsorbers or in existing filters or other containers. 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 on the outer and inner surface of the adsorbent. Once the concentration of impurities to be removed reaches some predetermined level, or after a predetermined time, the product can be replaced with fresh material.

Physical filtration of suspended solids also occurs; trapped solids and fines 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 the formation and deposition of dust.

It is recommended to store the product in the original package.

The product should not be stored together with acids or oxidizing agents.

A.6 Emergency procedures

A.6.1 First aid

In case of contact with the eyes, it is recommended to rinse thoroughly with plenty of water and seek medical advice.

In case of contact with the skin, it is recommended to wash with warm water.

A.6.2 Spillage

It is recommended to remove mechanically and to discard in a refuse container.

A.6.3 Fire

The product is non-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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