BS EN 12910:2012

BSI Standards Publication

Products used for treatment of water intended for human consumption — Garnet

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 12910:2012. It supersedes BS EN 12910:2005 which is withdrawn.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.

ISBN 978 0 580 77572 7

ICS 13.060.20; 71.100.80

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2013.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12910

November 2012

ICS 71.100.80

Supersedes EN 12910:2005

English Version

Products used for treatment of water intended for human consumption - Garnet

Produits utilisés pour le traitement de l'eau destinée à la consommation humaine - Grenat

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Granatsand

This European Standard was approved by CEN on 9 September 2012.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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 United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 12910:2012: E

Contents

Page

Foreword **3**
Introduction **4**
1 Scope **5**
2 Normative references **5**
3 Terms, definitions and symbols **5**
4 Description **5**
5 Physical properties **5**
6 Chemical properties **6**
7 Specific properties **7**
8 Test methods **7**
9 Labelling, transportation and storage **7**
Annex A (informative) **General information on garnet** **9**
Bibliography **12**

Foreword

This document (EN 12910:2012) 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 12910:2005.

The significant technical difference between this edition and EN 12910:2005 is as follows:

— Updating 9.2 in line with current legislation.

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 garnet used for treatment of water intended for human consumption. It describes the characteristics of garnet and specifies the requirements and the corresponding test methods for garnet. 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*

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)

Almandite $Fe_3Al_2(SiO_4)_3$.

Andradite $Ca_3Fe_2(SiO_4)_3$..

NOTE Both forms can have other metals in partial substitution for the major constituents.

4.2 Commercial form

Each of the two main types of garnet is available in different particle size grades.

5 Physical properties

5.1 Appearance

The product is a pink, red or brown to black coloured granular material. Cubic crystals; the particle shape can be angular to sub-angular to rounded depending on origin.

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 determined on samples taken at the point of manufacture using the method of test given in EN 12902.

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

The particle size distribution shall be described by either:

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

uniformity coefficient : (U) which shall be less than 1,5;

minimum size : (d_1) with a maximum deviation of ± 5 %;

or

b) by particle size range and by mass fraction of oversize and undersize particles according to application.

The maximum contents of oversize and undersize shall be a mass fraction of 5 % for application of the product as a filtration layer in multi media filters and a mass fraction of 10 % for use in single media filters. For use as a support layer, maximum mass fractions of oversize and undersize of 15 % are acceptable. See A.2.3 for examples of available particle sizes that are used.

NOTE 2 Other values can be necessary for certain applications.

5.3 Density

5.3.1 General

The density of garnet varies with the mineralogical form.

Garnet with absolute density lower than 3,8 g/cm^3 should not be used in multi media sand - garnet filters to prevent intermixing of media.

5.3.2 Bulk density loose

Almandite: The bulk density loose shall be in the range of 2 150 kg/m^3 to 2 250 kg/m^3.

Andradite: The bulk density loose shall be in the range of 1 850 kg/m^3 to 2 000 kg/m^3.

5.3.3 Bulk density packed

Almandite: The bulk density packed shall be in the range of 2 350 kg/m^3 to 2 400 kg/m^3.

Andradite: The bulk density packed shall be in the range of 1 950 kg/m^3 to 2 250 kg/m^3.

6 Chemical properties

This European Standard specifies the minimum purity requirements for garnet 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.

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.

The chemical composition varies with the mineralogical form. Typical data are given in Table A.1.

NOTE 1 Because of the nature of the occurrence and production of garnet, a small proportion of other minerals, in particular silica sand and ilmenite, can be present in the commercial product.

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

NOTE 2 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

Garnet is a non-reactive high density filtration and support medium. It is used specifically because of its high density.

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 in accordance with EN 12902.

8.2.2 Bulk density loose

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

8.2.3 Bulk density packed

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

9 Labelling, transportation and storage

9.1 Means of delivery

Garnet shall be delivered in bags, semi-bulk containers, or bulk.

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 in accordance with the EU legislation [1)]

Garnet is not listed within 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.

NOTE Additional national regulations may apply to the labelling of this product.

9.3 Transportation regulations and labelling

Garnet is not classified as dangerous product for road, rail, sea and air transportation.

Garnet is not listed under a UN Number [2)].

9.4 Marking

The marking shall include the following:

— name "Garnet", trade name and grade;

— net mass;

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

— statement "This product conforms to EN 12910".

9.5 Storage (long term stability)

Garnet can be stored for an unlimited period of time.

1) See [2].

2) United Nations Number.

Annex A
(informative)

General information on garnet

A.1 Origin

A.1.1 Raw material

Garnet exists in nature in six main varieties of which only two forms are generally used as filtration and supporting materials: almandite garnet and andradite garnet. Both these varieties occur as massive rock deposits and also as alluvial sands in both geological and modern beach deposits. Garnet rarely occurs as a single pure variety: the different forms often grade into each other with some replacement of the main metallic elements by minor ones. For this reason, the analyses of the same type of garnet from different deposits will vary.

A.1.2 Manufacturing process

Garnet is produced by mining and crushing rock deposits, by quarrying geological alluvial deposits or by collecting alluvial material deposited on modern beaches. The garnet is separated from other constituents such as silica and heavy minerals, and sieved to produce specific particle size ranges.

A.2 Typical properties

A.2.1 Chemical composition

Table A.1 shows the range of composition of the two main types of garnet used as filtering and supporting materials. Almandite and andradite garnets can usually be distinguished by their calcium and aluminium contents and by their densities.

Table A.1 — Typical chemical composition

Parameter	Typical value in mass fraction %	
	Almandite	Andradite
SiO_2	32 to 42	32 to 42
Al_2O_3	15 to 25	0 to 15
FeO	20 to 40	0 to 15
Fe_2O_3	0 to 15	20 to 35
TiO_2	0 to 5	0 to 5
CaO	0 to 5	20 to 38
MgO	0 to 15	0 to 5
MnO	0 to 5	0 to 5

The above analyses are typical of the two types of garnet but analyses can vary depending on the deposit. Mineralogical and petrological analyses can give additional information.

A.2.2 Mechanical strength

The mechanical strength of garnet is high.

Abrasion products consist of dust and small particles of material. They are formed during transportation, filling, and washing. Abrasion products are not completely removed by washing.

The existing methods for determination of abrasion do not lead to exact results regarding behaviour of filter media during operation. They can be used only for comparison of different filter media.

A.2.3 Examples of particle size distribution

Examples of particle size distribution described by different particle size ranges and a permissible mass fraction of oversize and undersize product, are given in Table A.2.

Table A.2 — Example of particle size range

Particle size range mm	**permissible mass fraction %** [a]	
	undersize	**oversize**
0,3 to 0,6	5	5
1,4 to 2,36	10	10
[a] Generally the maximum permitted mass fractions of undersize and oversize are 5 % for application of the product as a filtration layer in multi media filters and 10 % for use in single media filters.		

Other particle size ranges can be specified.

A.2.4 Density — absolute density

The absolute density is typically:

— Almandite : 4,10 g/cm^3;

— Andradite : 3,8 g/cm^3.

A.3 Use

A.3.1 Function

Garnet is used as a filtering and supporting material. It also has an application as a seeding material in pellet reactors.

Garnet used as a filtering material in multi media filters with silica sand should be as dense as possible in order to ensure efficient separation from the sand after fluidisation of the bed. Generally, almandite garnets are used for this purpose. Garnets used as supporting layers beneath filtering garnets need not have as high density as filtering garnets as these layers are not fluidised during backwashing.

A.3.2 Specific amount

The amount of garnet used depends on the application. Filtration rate and filter media depth vary with the suspended matter content of the water to be filtered.

A.3.3 Means of application

Garnet is used in open or closed single or multilayer filters.

A.3.4 Secondary effects

There are no secondary effects.

A.4 Hydraulic characteristics

A.4.1 Interstitial volume

The interstitial volume is approximately 0,4 (*V/V*). If used for calculations the interstitial volume should be measured.

A.4.2 Head loss in filtration

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

A.4.3 Expansion in up-flow washing

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

A.5 Rules for safe handling and use

Garnet is not a hazardous product.

It is recommended to avoid dust formation.

When handling dry product the use of a dust mask is recommended.

A.6 Emergency procedures

A.6.1 Accident - First aid

In case of contact with skin there is no danger, it is recommended to wash with water.

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

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

A.6.2 Spillage

It is recommended to sweep up and to discard in a refuse container or to repackage.

A.6.3 Fire

No special precautions are necessary.

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)

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™