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Proizvodi, ki se uporabljajo za pripravo pitne vode - Zrnato aktivno oglje

Products used for treatment of water intended for human consumption - Granular activated carbon

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Granulierte-Aktivkohle

Produits utilisés pour le traitement de l'eau destinée à la consommation humaine - Charbon actif en grains

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This European Standard 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of an identical text or by endorsement, at the latest by February 2000, and conflicting national standards shall be withdrawn at the latest by February 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland 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 Standard :

1) this 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 ;

2) 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.

1 Scope

This European Standard is applicable to virgin granular activated carbon used for treatment of water intended for human consumption. It describes the characteristics of granular activated carbon and specifies the requirements and the corresponding test methods for granular activated carbon. It gives information on its use in water treatment.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 12901, *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 and definitions

For the purpose of this standard, the definitions given in EN 12901 and the following definitions apply.

3.1
virgin activated carbon
freshly manufactured activated carbon that has not been used and has not been regenerated

3.2
wettability
ability of granular activated carbon to be wetted when in contact with water, determined by measuring the quantity of material which sinks in water under specified conditions

4 Description

4.1 Identification

4.1.1 Chemical name(s)

Carbon.

4.1.2 Synonym or common names

Virgin granular activated carbon, activated coal, activated charcoal, active carbon.

4.1.3 Chemical formula

C (elementary).

4.1.4 CAS Registry Number [1)]

7440- 44-0.

4.1.5 EINECS reference [2)]

231-153-3.

4.2 Commercial forms

Granular activated carbon is a granular product ; by convention not less than 90 percent by mass (% (*m/m*)) is retained on a 180 µm aperture test sieve (see 5.2). The product can be either shaped (moulded/extruded) or irregular (non-moulded), and is available in many grades, differing in adsorption characteristics, hardness, porosity, granulometry, shape and purity.

5 Physical properties

5.1 Appearance

Black, porous granules of irregular shape or, for moulded or extruded products, in forms such as uniform cylinders, pellets or spheres.

5.2 Particle size distribution

5.2.1 General

The particle size distribution shall be determined on samples taken at the point of manufacture using the method of test given in EN 12902. The particle size specification shall be within the manufacturer's stated tolerance.

NOTE 1 Different applications can require different particle size ranges.

NOTE 2 The particle size can decrease during transportation and handling.

5.2.2 Irregular (broken) product

The particle size distribution shall be described by either :

a) effective size, d_{10}, with a permitted tolerance of ± 5% ;

uniformity coefficient, U, which shall be less than 2,1 ;

minimum size, d_1, with a permitted tolerance of ± 5% ; or

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

The content of oversize plus undersize shall not exceed 15% (*m/m*) and not more than 5 % (*m/m*) shall be undersize.

NOTE Other values can be necessary for certain applications.

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1) Chemical Abstracts Service Registry Number

2) European Inventory of Existing Commercial Chemical Substances

5.2.3 Moulded/extruded product

Not more than 3 % (*m/m*) shall pass a test sieve with an aperture size as close as possible to 0,75 times the nominal particle diameter.

5.3 Wettability

The wettability shall be greater than 99 % (*m/m*) when tested according to 8.2.2.

5.4 Bulk density packed The bulk density packed shall be greater than 180 kg/m^3 when tested according to 8.2.3.

5.5 Mechanical strength The ball-pan hardness shall be greater than 75 when tested according to 8.2.4.

NOTE Products with a lower hardness are suitable for certain applications.

6 Chemical properties

6.1 General

Granular activated carbon is manufactured by controlled oxidation (by means of steam or chemicals) from carbonaceous raw materials including coconut, wood, peat or coal. The raw materials shall be stated by the manufacturer.

High internal porosity results in adsorptive properties and, depending on the raw material and the manufacturing process, it can have acid or basic properties. It is a reducing agent with catalytic properties. Activated carbon can react with oxidants to form carbon dioxide.

The carbon content of the commercial product does not affect adsorption characteristics.

6.2 Purity criteria

Limits have been given for impurities and toxic substances where these are likely to be present in significant quantities from the current production process and raw materials. If a change in the production process or raw materials leads to significant quantities of other impurities or by products being present, this shall be notified to the user.

6.2.1 Impurities and main by-products

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

Table 1 - Main impurities and by-products

Impurity		Limit in % (*m/m*)[a]
Ash	max.	15
Water [b] (at the time of packing) [c]	max.	5
Water-soluble material	max.	3
Zinc	max.	0,002
[a] Expressed on a dry basis except for water content [b] Higher or lower values can be necessary for certain applications. [c] The water content can increase after packing ; e.g. during transportation.		

6.2.2 Water-extractable toxic substances

NOTE For the purpose of this standard, "toxic substances" are those defined in the EU Directive 80/778/EEC of July 15, 1980 (see [1]).

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

Table 2 - Water extractable toxic substances

Substance		Limit in µg/l in the extraction water
Arsenic (As)	max.	10
Cadmium (Cd)	max.	0,5
Chromium (Cr)	max.	5
Mercury (Hg)	max.	0,3
Nickel (Ni)	max.	5
Lead (Pb)	max.	5
Antimony (Sb)	max.	3
Selenium (Se)	max.	3
Cyanide (CN)	max.	5
PAH [a]	max.	0,02
[a] Polycyclic Aromatic Hydrocarbons : the sum of the detected concentrations of fluoranthene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(ghi)perylene, indeno(1,2,3-cd)pyrene		

7 Specific properties

The iodine number of the granular activated carbon shall be not less than 600 mg/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 in accordance with EN 12902.

8.2.2 Wettability

8.2.2.1 Principle

Immersion of the product in boiling water. Cooling, sedimentation and filtration of the supernatant through a sieve to determine the quantity of material which is not wetted.

8.2.2.2 Reagents

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

8.2.2.3 Apparatus

Ordinary laboratory apparatus and glassware together the following.

8.2.2.3.1 Drying oven capable of being controlled at (150 ± 5) °C.

8.2.2.3.2 Hotplate.

8.2.2.3.3 Wire cloth sieve, with an aperture size as close as possible to the nominal undersize of the granular activated carbon (for moulded/extruded products, 0,75 times the nominal particle diameter).

8.2.2.3.4 Balance having an accuracy of ± 0,1 g.

8.2.2.4 Procedure

Take a sample of approximately 500 ml of granular activated carbon, dry at (150 ± 5) °C, and weigh (m_0). Bring 1 l of water to the boil in a 2 l glass beaker and add the granular activated carbon to the boiling water. Continue to boil for 10 min ± 30 s, swirling if necessary to remove carbon particles attached to the wall of the beaker. Remove from the hotplate (8.2.2.3.2) and cool to room temperature.

Carefully decant the supernatant water (approximately 500 ml), including any suspended or floating particles. Filter the supernatant through the sieve (8.2.2.3.3), collect the particles retained on the seive and dry to constant mass at (150 ± 5) °C (m_1).

8.2.2.5 Expression of results

The wettability, X_1, expressed as a percentage by mass (% (*m/m*)) of product, is given by the following equation :

$$X_1 = \frac{100 \times (m_0 - m_1)}{m_0}$$

where

m_0 is the mass, in grams of sample ;

m_1 is the mass, in grams of sample retained on the test sieve.