



SLOVENSKI STANDARD
SIST EN 16070:2014
01-junij-2014

Proizvodi, ki se uporabljajo za pripravo pitne vode - Naravni zeolit

Products used for treatment of water intended for human consumption - Natural Zeolite

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Natürlicher Zeolith

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

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ICS:

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|-----------|-----------------------------|-------------------------------------|
| 13.060.20 | Pitna voda | Drinking water |
| 71.100.80 | Kemikalije za čiščenje vode | Chemicals for purification of water |

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EUROPEAN STANDARD

EN 16070

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March 2014

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English Version

Products used for treatment of water intended for human consumption - Natural zeolite

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

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Natürlicher Zeolith

This European Standard was approved by CEN on 6 February 2014.

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

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Foreword

This document (EN 16070:2014) 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of an identical text or by endorsement, at the latest by September 2014 and conflicting national standards shall be withdrawn at the latest by September 2014.

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.

According to the CEN-CENELEC Internal Regulations, the national standards organizations 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.

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EN 16070:2014 (E)**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.

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1 Scope

This European Standard is applicable to natural zeolites used for treatment of water intended for human consumption. It describes the characteristics of natural zeolites and specifies the requirements and the corresponding test methods for natural zeolites. It gives information on their use in water treatment. The natural zeolites included in this standard are clinoptilolite, chabasite and phillipsite/analcime.

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 12902:2004, *Products used for treatment of water intended for human consumption - Inorganic supporting and filtering materials - Methods of test*

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

EN ISO 14911, *Water quality - Determination of dissolved Li⁺, Na⁺, NH₄⁺, K⁺, Mn²⁺, Ca²⁺, Mg²⁺, Sr²⁺ and Ba²⁺ using ion chromatography - Method for water and waste water (ISO 14911)*

3 Terms, definitions and symbols

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

4 Description

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4.1 Identification

4.1.1 Chemical name(s)

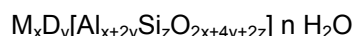
Crystalline hydrated aluminosilicate.

4.1.2 Synonym or common names

- Zeolite;
- Hydrated sodium, potassium, calcium, magnesium aluminosilicate.

4.1.3 Chemical formula

General formula:



where

M = Na, K, Li;

D = Ca, Mg;

x/y/z = 1 to 6;

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$n = 1$ to 6.

4.1.4 CAS Registry number ¹⁾

1318-02-1

12173-10-3

12271-42-0

12251-32-0

61027-84-7

1318-10-1

4.1.5 EINECS reference ²⁾

215-283-8

4.2 Commercial form

Natural zeolites are dry granular products, available in different particle sizes.

4.3 Types of natural zeolites

There are over 200 different zeolites with about 30 natural zeolites. However, not all natural zeolites can be used in the treatment of water intended for human consumption. Given the particular characteristics needed for this type of application, only three species are identified: clinoptilolite, chabazite and phillipsite/analcime. These zeolites are available in large quantities in Europe, with no trace of hazardous or toxic elements.

5 Physical properties**5.1 Appearance**

The product consists of dry, free flowing granules. The product has a granular shape and a rough texture.

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 %;
- median size: (d_{50}) with a maximum deviation of ± 5 %;

¹⁾ Chemical Abstracts Service Registry Number.

²⁾ European Inventory of Existing Commercial Chemical Substances.

uniformity coefficient: (U) 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 (see A.2.2.1).

The maximum permitted mass fractions of oversize and undersize are 5 %.

NOTE 2 Other values might be necessary for certain applications.

5.3 Density (bulk density loose)

The bulk density loose shall be in the range of:

- 800 kg/m³ to 1 100 kg/m³ for a clinoptilolite type zeolite;
- 700 kg/m³ to 850 kg/m³ for a chabazite type zeolite;
- 1 000 kg/m³ to 1 100 kg/m³ for a phillipsite/analcime type zeolite.

6 Chemical and mineralogical properties

6.1 General

This European Standard specifies the minimum purity requirements for natural zeolite 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 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 lead to significant quantities of impurities, by-products or additives being present, this shall be notified to the user.

The composition of the commercial product shall conform to Table 1.

Table 1 — Composition of commercial product

| Parameters | | Limit in mass fraction % |
|-------------------------|------|--------------------------|
| Mass loss at 150 °C | max. | 7 |
| Ignition loss at 650 °C | max. | 14 |

After filling, washing and commissioning of a filter system producing drinking water, natural zeolite 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.

EN 16070:2014 (E)**6.2 Capacity**

The cations that maintain the electronic neutrality of the zeolite structure can be exchanged. This is a selective cation exchange according to the zeolite affinity for the replacing cation. The total cation exchange capacity and the selectivity are specific to each type of zeolite. This property makes the zeolites especially useful and efficient for cation elimination or to achieve control of their concentration in water. Ammonium can be used as a quality standard to determine the Cation Exchange Capacity (CEC) of a natural zeolite.

The total CEC shall be not less than 1,2 mg of ammonium per gram zeolite.

7 Test methods**7.1 Sampling**

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

7.2 Analysis**7.2.1 Particle size distribution**

The particle size distribution shall be determined in accordance with EN 12902.

7.2.2 Bulk density loose

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

7.2.3 Mass loss at 150 °C

It is assumed that water is the only material present in the natural zeolite that is volatile at this temperature.

The mass loss shall be determined by the method for water content, heating to 150 °C, in accordance with EN 12902.

7.2.4 Precision - repeatability limit

The absolute difference between two single test results, obtained under repeatability conditions, shall not exceed the repeatability limit, r , in more than 1 in 20 cases.

$$r = 0,07 \times X_1 \quad (1)$$

where

X_1 is the measured value.

7.2.5 Ignition loss at 650 °C**7.2.5.1 Principle**

Heat the sample to constant mass at 650 °C. It is assumed that water, including chemically bound water and carbon dioxide produced from carbonates, are the only materials present in natural zeolite that are volatile at this temperature.

At 650 °C, the loss of water is practically complete.

7.2.5.2 Apparatus

Ordinary laboratory apparatus and glassware together with the following.

7.2.5.2.1 Muffle furnace, capable of being controlled at (650 ± 25) °C.

7.2.5.2.2 High temperature metal or ceramic crucible with lid.

7.2.5.2.3 Desiccator.

7.2.5.2.4 Analytical balance, having an accuracy of $\pm 0,1$ mg.

7.2.5.3 Procedure

Ignite the crucible and the lid (7.2.5.2.2) in the muffle furnace at (650 ± 25) °C for 1 h. Place the crucible and the lid in the desiccator, cool to room temperature and weigh to the nearest 0,1 mg; note the mass m_0 .

Place a 5 g to 10 g sample of natural zeolite into the pre-ignited crucible. Close the crucible and weigh immediately to the nearest 0,5 mg (m_1). Remove the lid and place the crucible and lid in the muffle furnace at (650 ± 25) °C and leave for 3 h. Place the crucible in the desiccator, cover it with the lid and allow to cool to room temperature. When cool, weigh to the nearest 0,5 mg (m_2).

7.2.5.4 Expression of results

The ignition loss, X_2 , expressed as a percentage mass fraction of dried product, is given by the formula:

$$X_2 = \frac{100 \times (m_1 - m_2)}{(m_1 - m_0)} \quad (2)$$

where

m_0 is the mass, in grams, of the empty crucible and lid;

m_1 is the mass, in grams, of the crucible and lid plus the sample;

m_2 is the mass, in grams, of the crucible and lid plus the ignited sample.

7.2.5.5 Precision - repeatability limit

The absolute difference between two single test results, obtained under repeatability conditions, shall not exceed the repeatability limit, r , in more than 1 in 20 cases.

$$r = 0,07 \times X_2 \quad (3)$$

7.2.6 Capacity

7.2.6.1 Principle

A sample of the zeolite is added to an ammonium chloride solution and the decrease of ammonium in the solution is determined after two hours. It is assumed that the ammonium capacity is a measure of the overall cation exchange capacity of the zeolite.

7.2.6.2 Apparatus

Ordinary laboratory apparatus and glassware together with the following.