TECHNICAL DOCUMENT

WATER TREATMENT DEVICES

Technical document 406-01

Regenerating salts:

Specifications complementary to the standards

Technical document 406-1 rev00
02/10/2017

CENTRE SCIENTIFIQUE ET TECHNIQUE DU BATIMENT
84 avenue Jean Jaurès – Champs-sur-Marne – 77447 Marne-la-Vallée Cedex 2
Tel. +33 (0)1 64 68 82 82 – www.cstb.fr
MARNE-LA-VALLÉE / PARIS / GRENOBLE / NANTES / SOPHIA-ANTIPOLIS

CSTB
le futur en construction

The CSTB (Centre Scientifique et Technique du Bâtiment), a public establishment supporting innovation in construction, has five key activities: research and expertise, assessment, certification, testing and dissemination of knowledge, organised to meet the challenges of ecological and energy transition in the construction sector. Its field of competence covers construction products, buildings and their integration into districts and towns.
With over 900 employees, its subsidiaries and networks of national, European and international partners, the CSTB group works for all the stakeholders in the construction sector to advance building quality and safety.

MODIFICATION HISTORY

Revision no.	Date	Modifications
00	02/10/2017	Update to the document introduction and reference.

Table of contents

This document modifies and completes Article 4 “Purity criteria” and Article 5 “Test methods” of Standard NF EN 973.

1. Purity criteria

Article 4.1 of the Standard, “Composition of the commercial product”, is replaced by the following:

“The sodium chloride content in the dry product shall not be less than 99.5% (m/m) of dry NaCl.

Note: An anti-foaming agent, sodium or potassium hexacyanoferrate [1] is authorised at a maximal rate of 20 mg/kg in the finished product, expressed in anhydrous potassium hexacyanoferrate ions [K_4FeCN_6] and, for the determination, see Point B.3.”

Article 4.2 of the Standard, “Main and associated impurities”, is replaced by the following:

“The product shall meet the specifications of Tables 1 and 2.”

Table 1: Impurities

Impurities	Maximal content expressed as a % of weight (m/m)
Matter that is insoluble in water	0.05
SO_4^{2-}	0.15
$Ca^{2+} + Mg^{2+}$	0.06

Table 2: Moisture content

Impurity	Limit % (m/m) of the NaCl content		
Moisture content		Dry salt	Wet salt
	max	0.6	5

Article 4.3 of the Standard, “Chemical parameters”, is replaced by the following:

“The product shall meet the specifications of Table 3.”

Table 3: Chemical parameters

Parameters	Maximal limit in mg/kg of the product
Arsenic (As)	0.5
Cadmium (Cd)	0.5
Chromium (Cr)	13
Mercury (Hg)	0.1
Nickel (Ni)	13
Lead (Pb)	2
Antimony (Sb)	2.6
Selenium (Se)	2.6
Copper (Cu)	2

[1] Number E 535 or E 536 (see bibliographical reference [2] of Standard NF EN 973)

2. Test methods

In Article 5.1 of Standard NF EN 973, “Sampling”, the procedure decided upon for preparing samples for the laboratory is the one described in Paragraph 5.6.7 of ISO 8213, “Sampling by the quartering method”.

Article 5.2.1 of the Standard, “Main product”, is replaced by the following:

2.1 Determination of the sodium chloride content

① Symbols used:

S is the sulphate content, expressed as a percentage in weight, determined according to ISO 2480;

C is the calcium content, expressed as a percentage in weight, determined according to ISO 2482;

M is the magnesium content, expressed as a percentage in weight, determined according to ISO 2482;

K is the potassium content, expressed as a percentage in weight, determined according to Appendix B.4 of Standard NF EN 973;

H is the theoretical value of the chloride content and H = 60.6838;

P is the weight loss at 110°C, expressed as a percentage in weight, determined in the following paragraph (“Moisture content”).

② Calculation:

H1, H2 and H3, expressed as percentages in weight, are determined in the following way:

Calculation of chloride contents H_1 and H_2:

Calculation of the calcium content C_1, expressed as a percentage in weight, corresponding to the sulphates:

$$C_1 = (S/96.1)x40.1$$

● If $C \geq C_1$, the sulphate is entirely combined in calcium sulphate and the remaining calcium is combined in calcium chloride.

The chloride content H_1, expressed as a percentage in weight, consumed by the remaining calcium is given by the formula:

$$H_1 = ((C-C1)/40.1)x35.5x2$$

The magnesium is entirely combined in magnesium chloride.

The chloride content H_2, expressed as a percentage in weight, consumed by the magnesium is given by the formula:

$$H_2 = (M/24.3)x35.5x2$$

● If $C < C_1$, the calcium is entirely combined in calcium sulphate and the remaining sulphate is combined in magnesium sulphate.

The remaining sulphate content S_1, expressed as a percentage in weight, is given by the formula:

$$S_1 = S- (C/40.1)x96.1$$

The magnesium content M_1, expressed as a percentage in weight, corresponding to the remaining sulphate, is given by the formula:

$$M_1 = (S_1/96.1)x24.3$$

If $M \geq M_1$, the remaining magnesium is combined in magnesium chloride. The chloride content H_2, expressed as a percentage in weight, consumed by the remaining magnesium, is given by the formula:

$$H_2 = ((M-M_1)/24.3)x2x35.5$$

If $M < M_1$, the remaining sulphate is then combined in sodium sulphate.

Calculation of the chloride content H_3:

The chloride content H_3, expressed as a percentage in weight, consumed by the potassium, is calculated in the following way:

$$H_3 = (K/39.1)x35.5$$

Calculation of the sodium chloride content based on the dry extract:

The remaining halides are expressed in sodium chloride.

The chloride content, expressed as a percentage in weight (% (m/m)), is as follows:

$$(H-H1-H2-H3)x(58.5/35.5)x(100/(100-P))$$

2.2 Moisture content

Article 5.2.2.2, “Moisture content”, is replaced by the following:

“The weight loss at 110°C shall be determined in the following way:

☞ Take at random a test weight of salt of about 10 grammes.

☞ Wrap this weight in a paper.

☞ Crush this salt with a hammer.

☞ Measure the weight loss as described in Standard ISO 2483.

Repeat the operation 3 times and calculate the average of the results obtained.”

2.3 Particle size distribution

The following paragraph, concerning the particle size distribution, is added:

“According to the brine production process, the particle size distribution of the salt is variable. It is defined by upper and lower limits, with indication of the corresponding tolerances.

For the salts coming in the form of pellets, the product shall not contain more than 4% in weight of particles passing through a sieve with 5 mm opening.

The particle size analysis of the sodium chloride shall be carried out in compliance with Standard NF ISO 2591-1.”