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## Method for the determination of C3A in the clinker from cement analysis

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## National foreword

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The UK participation in its preparation was entrusted to Technical Committee B/516, Cement and lime.

A list of organizations represented on this committee can be obtained on request to its secretary.

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English Version

## Method for the determination of C3A in the clinker from cement analysis

Verfahren für die Bestimmung des C3A-

Gehalts im Klinker aus der Zementanalyse

This Technical Report was approved by CEN on 12 May 2019. It has been drawn up by the Technical Committee CEN/TC 51.

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## Contents

Page

<b>European foreword</b> .....	<b>4</b>
<b>1 Scope</b> .....	<b>5</b>
<b>2 Normative references</b> .....	<b>5</b>
<b>3 Terms and definitions</b> .....	<b>5</b>
<b>4 Principle of the method</b> .....	<b>5</b>
<b>5 Expression of masses, volumes, factors and results</b> .....	<b>6</b>
<b>6 Ignitions</b> .....	<b>6</b>
<b>7 Determination of constant mass</b> .....	<b>6</b>
<b>8 Preparation of a test sample of cement</b> .....	<b>6</b>
<b>9 Reagents</b> .....	<b>7</b>
9.2 EDTA - dihydrated disodium salt of ethylenediaminetetra-acetic acid.....	7
9.3 0,025M EDTA solution .....	7
9.11 Hydrochloric acid, dilute (1 + 1).....	7
9.12 Hydrochloric acid, dilute (1 + 100).....	8
9.14 Sulfo-5-salicylic acid dehydrate .....	8
9.15 Sulphosalicylic acid indicator:.....	8
9.17 Acetic buffer solution at pH 4,7-4,8 .....	8
9.20 buffer solution, ammoniacal.....	8
9.22 Potassium hydroxide solution 4N,.....	8
9.23 Methylthymol blue complexone indicator.....	8
9.24 Methyl orange indicator .....	8
9.26 Methylthymol blue mix complexone indicator .....	8
9.28 Copper complexonate solution .....	8
9.30 Murexide indicator .....	9
9.33 Reagent for determination of carbon dioxide .....	9
<b>10 Apparatus</b> .....	<b>9</b>
10.3 Electric furnace or Bunsen burner for temperatures up to 950 °C .....	9
10.4 Electromagnetic stirrer .....	9
10.6 Vacuum filtration device.....	9
10.10 Platinum crucibles, 10 to 20 cm <sup>3</sup> capacity, with lids.....	9
10.11 Hot plate (or sand bath) capable of being set to temperatures up to 350°C.....	9
10.12 Sand bath set to a temperature of 105 ± 5°C (or bain-marie).....	9
<b>11 Determination of BCR residue on cement</b> .....	<b>12</b>
11.1 Procedure .....	12
<b>12 Decomposition of the test sample for CEM I and IV type cements</b> .....	<b>13</b>
12.1 General.....	13
12.2 Precipitation of silica: treatment with perchloric acid in covered beaker .....	13
<b>13 Decomposition of the BCR residue and precipitation of silica in the residue</b> .....	<b>14</b>
<b>14 Chemical analysis of the filtrate obtained from treatment of the test sample and of the filtrate obtained from treatment of the BCR residue</b> .....	<b>15</b>
14.1 General.....	15
14.2 Determination of ironoxide (Fe <sub>2</sub> O <sub>3</sub> ).....	15
14.3 Determination of aluminium oxide (Al <sub>2</sub> O <sub>3</sub> ).....	15
<b>15 Determination of Sulfur trioxide (SO<sub>3</sub>)</b> .....	<b>16</b>
<b>16 Volumetric determination of carbon dioxide (CO<sub>2</sub>) in the cement test sample</b> .....	<b>16</b>
<b>17 Chemical analysis by X-ray fluorescence</b> .....	<b>18</b>
<b>18 Calculation and expression of results</b> .....	<b>18</b>

This is a preview of "PD CEN/TR 17365:2019". [Click here to purchase the full version from the ANSI store.](#)

18.1	General .....	18
18.2	Calculation of the gypsum content .....	18
18.3	Calculation of the CaCO <sub>3</sub> content .....	18
18.4	Calculation of the pozzolana content .....	18
18.5	Calculation of the correction factor for cement types I .....	19
18.6	Calculation of the correction factor for cement types IV/A and IV/B .....	19
18.7	Calculation of the C <sub>3</sub> A, C <sub>4</sub> AF of clinker according to Bogue for cement types I: .....	19
18.8	Calculation of the C <sub>3</sub> A, C <sub>4</sub> AF of clinker according to Bogue for cement types IV/A and IV/B: .....	19
<b>19</b>	<b>Repeatability and reproducibility .....</b>	<b>19</b>
	<b>Bibliography .....</b>	<b>21</b>

This is a preview of "PD CEN/TR 17365:2019". [Click here to purchase the full version from the ANSI store.](#)

## **European foreword**

This document (CEN/TR 17365:2019) has been prepared by Technical Committee CEN/TC 51 "Cement and building limes", the secretariat of which is held by NBN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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## 1 Scope

This document describes the analytical procedures used to determine the content of  $C_3A$  in the clinker starting from a chemical analysis on cement. The method can be applied to CEM type I and IV for the determination of the requirement of  $C_3A$ , as defined on EN 197-1.

This document describes two methods, traditional wet and XRF analysis (EN 196-2), which can be considered to be equivalent, in the scope of this CEN/TR 17365, for the determination of  $Al_2O_3$ ,  $Fe_2O_3$  and  $SO_3$ .

The same methods are described in EN 196-2, but for the scope of this document, the X-ray fluorescence (XRF) is the preferred method to be used for the determination of  $Al_2O_3$ ,  $Fe_2O_3$  and  $SO_3$ .

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 196-2, *Method of testing cement — Part 2: Chemical analysis of cement*

EN 196-7, *Methods of testing cement — Part 7: Methods of taking and preparing samples of cement*

ISO 385, *Laboratory glassware — Burettes*

ISO 835, *Laboratory glassware — Graduated pipettes*

## 3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

## 4 Principle of the method

The principle of the method is based on the calculation of the amounts of  $Al_2O_3$  and  $Fe_2O_3$  that may be occurring in the clinker by the chemical analysis of cement corrected for the oxide fraction resulting from materials other than clinker.

Once  $Al_2O_3$  and  $Fe_2O_3$  values are obtained, the amount of  $C_3A$  in the clinker is calculated according to Bogue.

The following assumptions should be made to determine the  $Al_2O_3$  and  $Fe_2O_3$  amounts in the clinker:

- a) Any sulfate occurring in the cement is ascribable to  $CaSO_4 \cdot 2H_2O$ ; all determined  $CO_2$  is  $CaCO_3$ . Moreover, the  $Al_2O_3$  and  $Fe_2O_3$  input from minor additional constituents and calcium sulfate is assumed to be zero.
- b) The residue from the base-complexing agent treatment (BCR) is constituted by pozzolanic materials only (natural pozzolana, siliceous fly ash and microsilica) and the dissolution is selective and complete.

Based on the above assumptions and on the calculated quantities of  $CaSO_4 \cdot 2H_2O$  and  $CaCO_3$ ,  $Al_2O_3$  and  $Fe_2O_3$  percentages in the clinker can be calculated by subtracting the oxide fraction in the cement and the BCR, corrected for the amount of gypsum and pozzolanic materials (see [Figure 1](#)).