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Descriptors: Ceramics, characteristics, tests, determination, bulk density, porosity, quality

English version

Advanced technical ceramics — Monolithic ceramics — General and textural properties — Part 2 : Determination of density and porosity

Céramiques techniques avancées — Céramiques monolithiques — Propriétés générales et structurales — Partie 2 : Détermination de la masse volumique et de la porosité

Hochleistungskeramik — Monolithische Keramik — Allgemeine und strukturelle Eigenschaften — Teil 2 : Bestimmung von Dichte und Porosität

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC184 'Advanced technical ceramics' the secretariat of which is held by BSI.

EN 623 *Advanced technical ceramics — Monolithic ceramics — General and textural properties* consists of four Parts:

Part 1 : Determination of the presence of defects by dye penetration tests

Part 2 : Determination of density and porosity

Part 3 : Determination of grain size[1)]

Part 4 : Determination of surface roughness[1)]

The 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of an identical text or by endorsement, at the latest by March 1994, and conflicting national standards shall be withdrawn at the latest by March 1994.

In accordance with the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

Contents

[1)] Parts 3 and 4 of this European Standard will be published as ENV.

1 Scope

This Part of EN 623 describes methods for determination of the bulk density, apparent solid density, and apparent porosity of advanced technical ceramics.

Two methods are described and are designated as Methods 1 and 2, as follows.

Method 1. Determination of bulk density, apparent solid density and apparent porosity by the evacuation method.

NOTE 1. This method is not suitable for the determination of apparent porosity of less than 1 %. A method for determining the presence of defects and surface porosity in this type of material is given in EN 623 : Part 1.

NOTE 2. The method is also not suitable for materials which are known to have an average pore size of greater than 200 μm.

Method 2. Determination of bulk density only, by measurement of dimensions and mass.

NOTE 3. Neither of these test methods measures total porosity including open and closed pores. This parameter may be calculated from the test results of Method 1 if the true density of pore-free material is known.

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 623-1	*Advanced technical ceramics — Monolithic ceramics — General and textural properties* Part 1 : *Determination of the presence of defects by dye penetration tests*
EN 45001	*General criteria for the operation of testing laboratories*
EN 1006	*Advanced technical ceramics — Methods of testing monolithic ceramics — Guidance on the sampling and selection of test pieces*
ISO 758 : 1976	*Liquid chemical products for industrial use — Determination of density at 20 °C*
ISO 3611 : 1978	*Micrometer callipers for external measurement*
ISO 4964 : 1984	*Steel — Hardness conversions*
ISO 6906 : 1984	*Vernier callipers reading to 0,02 mm*

3 Definitions

For the purposes of this Part of EN 623 the following definitions apply.

3.1 open pores

Pores that are penetrated by an immersion liquid in vacuum, or that are connected with the atmosphere, either directly or via one another.

3.2 closed pores

Pores that are not penetrated by the immersion liquid, or that are not connected with the atmosphere.

3.3 bulk volume V_b

The sum of the volumes of the solid material, the open pores and the closed pores in a porous body.

3.4 true volume

The volume of a body occupied by solid material, excluding all forms of porosity.

3.5 apparent solid volume V_s

The sum of the volume of the closed pores and true volume.

3.6 bulk density ρ_b

The ratio of the mass of the dry material of a porous body to its bulk volume.

3.7 geometric bulk density

The mass per unit total volume of a material including all porosity accessible and in accessible from the surface, the volume being calculated from linear dimensions.

3.8 apparent solid density ρ_s

The ratio of the mass of the dry material to its apparent solid volume.

3.9 apparent porosity π_a

The ratio of the total volume of the open pores in a porous body to its bulk volume.

4 Statement of accuracy and errors

The minimum accuracy of measurement of the parameters used in calculation of densities and porosities is given in table 1.