Irish Standard
I.S. EN 1006:2009

Advanced technical ceramics - Monolithic ceramics - Guidance on the selection of test pieces for the evaluation of properties

I.S. EN 1006:2009

Incorporating amendments/corrigenda issued since publication:

This document replaces:	*This document is based on:*	*Published:*
I.S. ENV 1006:2003	EN 1006:2009 ENV 1006:2003	15 July, 2009 30 July, 2003

This document was published under the authority of the NSAI and comes into effect on:
9 September, 2009

ICS number:
81.060.30

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F

Údarás um Chaighdeáin Náisiúnta na hÉireann

I.S. EN 1006:2009

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1006

July 2009

ICS 81.060.30

Supersedes ENV 1006:2003

English Version

Advanced technical ceramics - Monolithic ceramics - Guidance on the selection of test pieces for the evaluation of properties

Céramiques techniques avancées - Céramiques monolithiques - Guide de sélection des éprouvettes pour l'évaluation des propriétés

Hochleistungskeramik - Monolithische Keramik - Leitlinie zur Auswahl von Proben für die Beurteilung von Eigenschaften

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN 1006:2009: E

Contents

Foreword

This document (EN 1006:2009) has been prepared by Technical Committee CEN/TC 184 “Advanced technical ceramics”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by January 2010, and conflicting national standards shall be withdrawn at the latest by January 2010.

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Introduction

Advanced technical ceramics have a wide range of applications and functions and, in the as-manufactured condition, have characteristics which require inspection by a variety of techniques not commonly adopted for other classes of material, e.g. mechanical proof testing.

1 Scope

This European standard gives guidance on selection of test-pieces for the evaluation of properties. Important factors requiring attention in the preparation of test samples from large components or blocks of material are also described.

2 Terms and definitions

For the purposes of this European standard, the following terms and definitions apply.

2.1
batch
population of manufactured units of a single type, grade, size and composition, manufactured under essentially the same conditions at the same time, from which a sample is to be taken for inspection and/or testing to determine the conformance with acceptability criteria

NOTE Sometimes referred to as a 'lot'.

2.2
sample
sample consists of one or more manufactured units taken from a batch, these being selected at random without regard for their quality

2.3
sample size
number of units in a sample

3 Selection of test-pieces

3.1 General

The basis of any inspection of any material or batch of manufactured units is to obtain sound information on their fitness for purpose (quality). Advanced technical ceramics are diverse in material, format and application as are the methods devised to test their fitness for purpose. Before arranging any inspection or testing scheme it is wise to consider in depth the nature of the material, its final format in relation to test-pieces required for tests, the accuracy of test methods and the failure criticality in its application.

NOTE It is not the purpose of this European standard to define criteria for fitness for purpose. This is subject to agreement between parties.

3.2 Material homogeneity and anisotropy

3.2.1 Most advanced technical ceramic materials are made by powder technology processes involving the formation of a rigidized powder mass (e.g. pressing, slip casting, etc.) before subjecting this to a densification process (e.g. sintering, reaction bonding, hot pressing). The homogeneity and isotropy of the rigidized powder mass and the control imposed during the subsequent densification process can exert a considerable influence on the homogeneity of the final densified product. Consequently, attributes can vary from one place to another within a component or between components of the same batch.

3.2.2 One of the principal sources of a variation of attributes is density, arising from inhomogeneity of unfired (green) density, which has a subsequent significant effect on many mechanical properties. Large localised variations in unfired density are usually manifest as excessive distortion in firing, porous regions, or cracking. Other varying attributes are grain size (usually resulting from varying heat