INTERNATIONAL STANDARD

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Second edition
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Fine ceramics (advanced ceramics, advanced technical ceramics) — Mechanical properties of ceramic composites at ambient temperature in air atmospheric pressure — Determination of tensile properties

Céramiques techniques — Propriétés mécaniques des céramiques composites à température ambiante sous air à pression atmosphérique — Détermination des propriétés en traction

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 206, *Fine ceramics*.

This second edition cancels and replaces the first edition (ISO 15733:2001), which has been technically revised.

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Fine ceramics (advanced ceramics, advanced technical ceramics) — Mechanical properties of ceramic composites at ambient temperature in air atmospheric pressure — Determination of tensile properties

1 Scope

This International Standard specifies the conditions for determination of tensile properties of ceramic matrix composite materials with continuous fibre reinforcement at room temperatures. This International Standard applies to all ceramic matrix composites with a continuous fibre reinforcement, unidirectional (1D), bi-directional (2D), and tri-directional (xD, with $2 < x \leq 3$), loaded along one principal axis of reinforcement.

NOTE In most cases, ceramic matrix composites to be used at high temperature in air are coated with an antioxidation coating.

2 Normative references

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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.

ISO 3611, *Geometrical product specifications (GPS) — Dimensional measuring equipment: Micrometers for external measurements — Design and metrological characteristics*

ISO 7500-1:2004, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system*

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3 Terms, definitions and symbols

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

3.1
calibrated length
l
part of the test specimen that has uniform and minimum cross-section area

3.2
gauge length
L_0
initial distance between reference points on the test specimen in the calibrated length

3.3
initial cross-section area
S_0
initial cross-section area of the test specimen within the calibrated length

3.4
effective cross-section area
$S_{0\ \mathrm{eff}}$
total area corrected by a factor, to account for the presence of a coating

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3.5
longitudinal deformation
A
increase in the gauge length between reference points under a tensile force

3.6
longitudinal deformation under maximum tensile force
A_m
increase in the gauge length between reference points under maximum tensile force

3.7
tensile strain
ε
relative change in the gauge length defined as the ratio A/L_o

3.8
tensile strain under maximum force
ε_m
relative change in the gauge length defined as the ratio A_m/L_o

3.9
tensile stress
σ
tensile force supported by the test specimen at any time in the test divided by the initial cross-section area (S_o)

3.10
effective tensile stress
σ_{eff}
tensile force supported by the test specimen at any time in the test divided by the effective cross-section area ($S_{o\ eff}$)

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3.11
maximum tensile force
F_m
highest recorded tensile force in a tensile test on the test specimen when tested to failure

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3.12
tensile strength
σ_m
ratio of the maximum tensile force to the initial cross-section area (So)

3.13
effective tensile strength
$\sigma_{m\ eff}$
ratio of the maximum tensile force to the effective cross-section area

3.14
proportionality ratio or pseudo-elastic modulus
EP
slope of the initial linear section of the stress-strain curve, if any

Note 1 to entry: Examination of the stress-strain curves for ceramic matrix composites allows definition of the following cases:

a) Material with an initial linear domain in the stress-strain curve.

For ceramic matrix composites that have a mechanical behaviour characterized by an initial linear section, the proportionality ratio is defined as:

$$EP(\sigma_1,\sigma_2) = \frac{(\sigma_2 - \sigma_1)}{(\varepsilon_2 - \varepsilon_1)}$$

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