SLOVENSKI STANDARD
oSIST prEN ISO 14574:2024

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Fina keramika (sodobna keramika, sodobna tehnična keramika) - Mehanske lastnosti keramičnih kompozitov pri visoki temperaturi - Ugotavljanje nateznih lastnosti (ISO/DIS 14574:2024)

Fine ceramics (advanced ceramics, advanced technical ceramics) - Mechanical properties of ceramic composites at high temperature - Determination of tensile properties (ISO/DIS 14574:2024)

Hochleistungskeramik - Mechanische Eigenschaften von keramischen Verbundwerkstoffen bei hoher Temperatur - Bestimmung der Eigenschaften unter Zug (ISO/DIS 14574:2024)

Céramiques techniques - Propriétés mécaniques des céramiques composites à haute température - Détermination des caractéristiques en traction (ISO/DIS 14574:2024)

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Fine ceramics (advanced ceramics, advanced technical ceramics) — Mechanical properties of ceramic composites at high temperature — Determination of tensile properties

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT),see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC *206,Fine ceramics*.

This second edition cancels and replaces the first edition (ISO 14574:2013), which has been technically revised.

The main changes are as follows:

— alignment of the terms and definition with the vocabulary standard;

— addition of illustration of tensile modulus in Annex A;

— addition of a calibration method of the test temperature by using a cartographic specimen equipped with thermocouples in Annex B.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Fine ceramics (advanced ceramics, advanced technical ceramics) — Mechanical properties of ceramic composites at high temperature — Determination of tensile properties

1 Scope

This document describes procedures for determination of the tensile behaviour of ceramic matrix composite materials with continuous fibre reinforcement at elevated temperature in air, vacuum and inert gas atmospheres. This method applies to all ceramic matrix composites with a continuous fibre reinforcement, uni-directional (1D), bidirectional (2D) and multi-directional (xD, with x> 2), tested along one principal axis of reinforcement or off axis conditions for 2D and xD materials. This method also applies to carbon-fibre-reinforced carbon matrix composites (also known as carbon/carbon or C/C).

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

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.

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

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

ISO 9513, *Metallic materials — Calibration of extensometer systems used in uniaxial testing*

ISO 17161, *Fine ceramics (advanced ceramics, advanced technical ceramics) — Ceramic composites — Determination of the degree of misalignment in uniaxial mechanical tests*

ISO 19634, *Fine ceramics (advanced ceramics, advanced technical ceramics) — Ceramic composites — Notations and symbols*

ISO 20507, *Fine ceramics (advanced ceramics, advanced technical ceramics) — Vocabulary*

IEC 60584-1:2013, *Thermocouples – Part 1: EMF specifications and tolerances*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20507 and 19634 and the following apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
test temperature
T
temperature of the test piece at the centre of the gauge length

3.2
calibrated length
l
part of the test specimen that has uniform and minimum cross-section area

[SOURCE: ISO 20504, 3.1]

3.3
gauge length
L_0
initial distance between reference points on the test specimen in the calibrated length

[SOURCE: ISO 20504, 3.2]

3.4
controlled-temperature zone
part of the calibrated length, including the gauge length, where the temperature is within a range of 50 °C of the test temperature

3.5
initial cross-section area
S_o
cross-section area of the test specimen within the calibrated length, at room temperature before testing

Note 1 to entry: Two initial cross-section areas of the test specimen can be defined as follows.

3.6
apparent cross-section area
$S_{o\ app}$
area of the cross section

3.7
effective cross-section area
$S_{o\ eff}$
area corrected by a factor, to account for the presence of a coating

3.8
longitudinal deformation
A
increase in the gauge length under a tensile force in the load direction

Note 1 to entry: The longitudinal deformation corresponding to the maximum tensile force is denoted as Am.

3.9
tensile strain
ε
Ratio of deformation to initial gauge length defined as the ratio A/*L*0

Note 1 to entry: The tensile strain corresponding to the maximum tensile force is denoted as ε_m.

3.10
tensile force
F
uniaxial force carried by the test specimen at any time during the tensile test

3.11
tensile stress
σ
tensile force (3.10) supported by the test specimen at any time in the test divided by the *initial cross-sectional area* (3.5) such that $\sigma = F/S_o$

Note 1 to entry: Two compressive stresses depending of initial cross-section area can be defined as follows.

3.12
apparent tensile stress
σ_{app}
ratio of the *tensile force* (3.10) supported by the test piece to the *apparent cross-section area* (3.6)

3.13
effective tensile stress
σ_{eff}
ratio of the *tensile force* (3.10) carried by the test piece to the *effective cross-section area* (3.7)

3.14
maximum tensile force
F_m
highest force recorded or force at failure during a tensile test

3.15
tensile strength
σ_m
greatest *tensile stress* (3.11) applied to a test specimen when tested to failure

Note 1 to entry: Two tensile strengths depending of initial cross-section area can be defined as follows.

3.16
apparent tensile strength
$\sigma_{m\,app}$
ratio of the *maximum tensile force* (3.14) to the *apparent cross-section area* (3.6)

3.17
effective tensile strength

$\sigma_{m\,eff}$
ratio of the *maximum tensile force* (3.14) to the *effective cross-section area* (3.7)

3.18
tensile modulus
E
slope of the linear section of the stress-strain curve at or near the origin

Note 1 to entry: The linear part may not exist or may not start at the origin. The different situations are then described in the annex A.

Note 2 to entry: Two tensile moduli depending of initial cross-section area can be defined as follows.

3.19
apparent tensile modulus
E_{app}
slope of the linear part of the stress-strain curve at or near the origin when the apparent tensile stress is used

3.20
effective tensile modulus
E_{eff}
slope of the linear part of the stress-strain curve at or near the origin, when the effective tensile stress is used