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International Standard

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Fine ceramics (advanced ceramics, advanced technical ceramics) — Methods of tests for reinforcements — Determination of the tensile properties of ceramic filaments at elevated temperature in air using the hot grip technique

Céramiques techniques — Méthodes d'essais pour renforts — Détermination des propriétés en traction des filaments à température élevée par la technique des mors chauds

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Foreword

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

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Fine ceramics (advanced ceramics, advanced technical ceramics) — Methods of tests for reinforcements — Determination of the tensile properties of ceramic filaments at elevated temperature in air using the hot grip technique

1 Scope

This document specifies a test method for determination of tensile properties, such as tensile strength, Young's modulus, and fracture strain of ceramic filaments at elevated temperature in air using the hot grip technique. This document applies to continuous ceramic filaments obtained either from a multifilament bundle or spool. This document does not apply to ceramic filaments with creep behaviour at test temperature. The hot grip technique is limited by the temperature resistance of the current ceramic adhesive.

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 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 10548, *Carbon fibre — Determination of size content*

ISO 11567, *Carbon fibre — Determination of filament diameter and cross-sectional area*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

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

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 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
gauge length
L_0
initial inner distance between tubular grips glued to fibre ends at room temperature

[SOURCE: ISO 19630:2017, 3.1]

3.2
initial cross-section area
S_0
initial area of the cross section of the filament within the *gauge length* (3.1) determined at room temperature

[SOURCE: ISO 19630:2017, 3.3, modified — "determined at room temperature" added to definition.]

3.3
maximum tensile force
F_m
highest recorded tensile force on the test specimen when tested to failure

[SOURCE: ISO 19630:2017, 3.4.]

3.4
tensile strength
σ_m
ratio of the *maximum tensile force* (3.4) to the *initial cross-section area* (3.2)

[SOURCE: ISO 19630:2017, 3.6]

3.5
total compliance
C_t
inverse of the slope in the linear part of the force/displacement curve

[SOURCE: ISO 19630:2017, 3.8]

3.6
load train compliance
C_l
ratio of the displacement, excluding any test specimen contribution, to the corresponding force during the tensile test

[SOURCE: ISO 19630:2017, 3.9]

3.7
strain
ε
ratio of the longitudinal deformation to the *gauge length* (3.1)

[SOURCE: ISO 19630:2017, 3.10]

3.8
fracture strain
ε_m
strain at failure of the test specimen

[SOURCE: ISO 19630:2017, 3.11]

3.9
elastic modulus
E
slope of the linear part of the tensile stress-strain curve

[SOURCE: ISO 19630:2017, 3.12]

4 Principle

For the hot-grip technique, the ends of a ceramic filament are bonded to two ceramic tubes by using adhesive with high temperature resistance at test temperature. The ceramic filament specimen is heated to the test