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Fine ceramics (advanced ceramics, advanced technical ceramics) — Methods of test for reinforcements — Determination of the tensile properties of resin-impregnated yarns

Céramiques techniques — Méthodes d'essai pour renforts — Détermination des propriétés en traction des fils imprégnés de résine

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Foreword

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

This second edition cancels and replaces the first edition (ISO 24046:2022), which has been technically revised.

The main changes are as follows:

— definitions 3.1, 3.2, 3.3, and 3.9 corrected;

— revision of 9.4 and 9.5 associated with the correction of terms and definitions.

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.

Introduction

Fine ceramics are widely used in various fields, such as machinery, electronics, chemistry, construction, energy, aerospace and the nuclear industry, and in environmental applications. Fibre-reinforced ceramic matrix composites (CMCs) have been the subject of extensive research and development. CMCs are lightweight, have suitable chemical and thermal stability, and exhibit high strength, elastic modulus and creep resistance. These composites have been applied in devices and components in the aerospace industry and in high-temperature applications.

CMCs have been put to practical use as components in the jet engines of passenger planes and are also being developed as components of gas turbines for electric power generation.

The reliability of CMCs is influenced by the properties of the reinforcing fibre. High reliability is particularly important for jet engine parts. The mechanical properties of these fibres also require fixed values and distribution.

This document establishes a method for the measurement of mechanical properties such as tensile strength, elastic modulus and strain at the maximum force of a resin-impregnated yarn specimen prepared from the reinforcing ceramic fibre in CMCs.

Fibre and CMC manufacturers can use this method to perform quality control and relative comparison of ceramic fibres used as the reinforcement of CMCs.

Fine ceramics (advanced ceramics, advanced technical ceramics) — Methods of test for reinforcements — Determination of the tensile properties of resin-impregnated yarns

1 Scope

This document specifies a method for the determination of the tensile strength, tensile modulus of elasticity and strain at the maximum force of a resin-impregnated yarn specimen at ambient temperature. This method is applicable to yarns of ceramic fibres that are used as reinforcements in composite materials. The test results obtained by this method are applicable for quality control and comparison of the ceramic fibres.

The outputs of this method are not comparable to the strength of filaments derived from tensile tests on dry tows specified in ISO 22459.

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 1889, *Reinforcement yarns — Determination of linear density*

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 10119, *Carbon fibre — Determination of density*

ISO 10548, *Carbon fibre — Determination of size content*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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 distance between reference points on the test specimen in the calibrated length

[SOURCE: ISO 19634:2017, 4, Table 2.]

3.2
longitudinal deformation
A
variation in the *gauge length* (3.1) caused by an applied load

Note 1 to entry: Variation is positive in tensile and negative in compressive test.