INTERNATIONAL STANDARD

ISO 21712

First edition
2020-03

Fine ceramics (advanced ceramics, advanced technical ceramics) — Test method for flexural bond strength of ceramics

Céramiques techniques (céramiques avancées, céramiques techniques avancées) – Méthodes d'essai pour déterminer la résistance d'adhésion en flexion des céramiques

Reference number
ISO 21712:2020(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ..... **iv**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **1**

4 Principle **2**

5 Apparatus **4**
5.1 Testing machine 4
5.2 Test fixture 4
5.2.1 General 4
5.2.2 Bearings 4
5.2.3 Positioning of bearings 4
5.2.4 Fixture material 4
5.3 Micrometer 4

6 Test specimens **4**
6.1 Specimen size 4
6.1.1 Type A specimens 4
6.1.2 Type B specimens 5
6.1.3 Chamfering and rounded edge 5
6.2 Specimen preparation 7
6.2.1 General 7
6.2.2 Custom machining procedure 7
6.2.3 Component-matched procedure 7
6.2.4 Basic machining procedure 7
6.2.5 Parallelism, orthogonality and chamfer sizes 8
6.2.6 Handling of specimens 8
6.2.7 Number of specimens 8

7 Procedure **8**

8 Calculation **11**

9 Test report **12**

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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*.

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) — Test method for flexural bond strength of ceramics

1 Scope

This document specifies a test method for determining the flexural bond strength of ceramic/ceramic joints or ceramic/metal joints at room temperature. The substrate materials, for example ceramic or metal, are both monolithic. This method can be used to test the interfacial bond strength of the joint under bending conditions. It can be used for the development of joining materials and/or for the quality control of joints, the characterization and generating design data purposes.

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: Micrometers for external measurements — Design and metrological characteristics*

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 14704:2016, *Fine ceramics (advanced ceramics, advanced technical ceramics) — Test method for flexural strength of monolithic ceramics at room temperature*

3 Terms and definitions

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

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

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

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

3.1
flexural bond strength
maximum stress at fracture at the bond interface of a specified beam containing the ceramic/ceramic joint or the ceramic/metal joint subjected to bending

3.2
four-point flexure
configuration of flexural test where a specimen is subjected to equal loads through two bearings symmetrically located between two support bearings

Note 1 to entry: See Figure 1 a) and b).

Note 2 to entry: The bearings may be cylindrical rollers or cylindrical bearings.

3.3
four-point 1/4 point flexure
specific configuration of four-point flexural test where the inner bearings are situated one-quarter of the support span away from the two outer bearings

Note 1 to entry: See Figure 1 a) and Table 1.

3.4
four-point 1/3 point flexure
specific configuration of four-point strength test where the inner bearings are situated one-third of the support span away from the two outer bearings

Note 1 to entry: See Figure 1 b) and Table 1.

3.5
semi-articulating fixture
test fixture designed to apply uniform and even loading to test specimens that have flat and parallel surfaces

3.6
fully articulating fixture
test fixture designed to apply uniform and even loading to specimens that may have uneven, non-parallel or twisted surfaces

4 Principle

A beam-type specimen containing the specific bond joint with a rectangular cross-section or circular cross-section is loaded in flexure until fracture. The load at fracture, the geometry of the test fixture and specimen dimensions are used to compute the flexural bond strength, which is a measure of the bond strength. The material or joining interface is assumed to be linearly elastic.