
**Fine ceramics (advanced ceramics,
advanced technical ceramics) —
Determination of elastic modulus of
ceramics at high temperature by thin
wall C-ring method**

*Céramiques techniques (céramiques avancées, céramiques techniques
avancées) – Détermination du module élastique des céramiques à
haute température par la méthode de l’anneau en C à parois minces*

(<https://standards.iteh.ai>)
Document Preview

[ISO 21713:2020](https://standards.iteh.ai/catalog/standards/iso/301bffb8-ba98-4689-9ca1-ab2eecd63f7/iso-21713-2020)

<https://standards.iteh.ai/catalog/standards/iso/301bffb8-ba98-4689-9ca1-ab2eecd63f7/iso-21713-2020>



iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

ISO 21713:2020

<https://standards.iteh.ai/catalog/standards/iso/301bffb8-ba98-4689-9ca1-ab2eecd63f7/iso-21713-2020>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2020

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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	3
5.1 Testing machine.....	3
5.2 Heating system.....	4
5.2.1 General.....	4
5.2.2 Test piece temperature stability.....	4
5.2.3 Test temperature uniformity.....	4
5.2.4 Furnace heating rate.....	4
5.2.5 Furnace stability.....	4
5.3 Temperature-measuring and indicating instruments.....	4
5.3.1 General.....	4
5.3.2 Thermocouples.....	4
5.3.3 Verification of the thermocouple temperature-measuring system.....	4
5.4 Vacuuming machine.....	4
5.5 Data acquisition.....	4
5.6 Dimension-measuring device.....	5
6 Test pieces	5
6.1 Test piece size and preparation.....	5
6.1.1 General.....	5
6.1.2 Test piece storage.....	5
6.1.3 Number of test pieces.....	5
6.2 Rigid disk preparation.....	5
7 Test procedures	6
7.1 Check of vacuuming system.....	6
7.2 Check of heating system.....	6
7.3 Testing machine and loading speed.....	6
7.4 Elastic modulus measurement steps.....	6
7.5 Test validity requirement.....	7
8 Calculation of results	8
8.1 Calculation of the elastic modulus.....	8
8.2 Mean value and standard deviation for elastic modulus.....	8
9 Test report	8
Bibliography	10

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.

<https://standards.iteh.ai>

<https://standards.iteh.ai/catalog/standards/iso/301bffb8-ba98-4689-9ca1-ab2eecd63f7/iso-21713-2020>

Fine ceramics (advanced ceramics, advanced technical ceramics) — Determination of elastic modulus of ceramics at high temperature by thin wall C-ring method

1 Scope

This document specifies the determination of elastic modulus of ceramics at high temperatures up to 2 100 °C by using the thin wall relative C-ring method. Procedures for test piece preparation, test modes, heat rate, load rates, data collection and reporting are given.

This document applies primarily to ceramic materials including monolithic fine ceramics, refractory materials, whisker and particulate-reinforced ceramic composites. This method is not applicable to super plastic ceramics or ceramics with high creep rate. This test method can be used for material research, quality control and characterization and design data generation 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*

IEC 60584-1, *Thermocouples — Part 1: Reference tables*

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

elastic modulus

ratio of stress to strain, also known as Young's modulus

3.2

C-ring test piece

test piece in the shape of a split ring, prepared by cutting an incision from a thin wall ring

Note 1 to entry: R is the outer radius, r is the inner radius, and b is the width (axial length), as shown in [Figure 1](#).

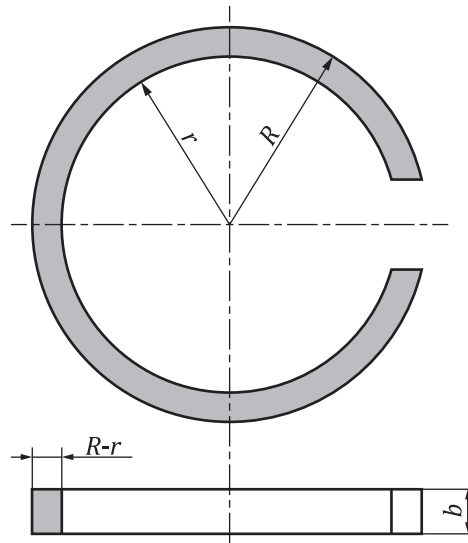


Figure 1 — Schematic diagram of C-ring test piece

3.3
rigid disk

disk which has the same radius and width as the C-ring test piece (3.2), but which is much stiffer

3.4
relative C-ring method

testing method for determining the deformation of the C-ring by comparing the crossbeam displacements of the C-ring and the rigid disk under same testing conditions

4 Principle

At ambient temperature, install a C-ring test piece on the fixture and keep the notch at the middle height. Place the fixture on the flat anvil of a mechanical testing machine and apply a symmetrically compressive load, F , on the C-ring within its range of elasticity, as shown in Figure 2 a) and b). There is a linear relationship between the load increment, ΔF , and the displacement increment, $\Delta\delta$. The compressive deformation of the C-ring can be directly measured by an accurate inductance micrometer or any other displacement meter at room temperature. The elastic modulus can be obtained from the load-deformation curve and the test piece dimensions.

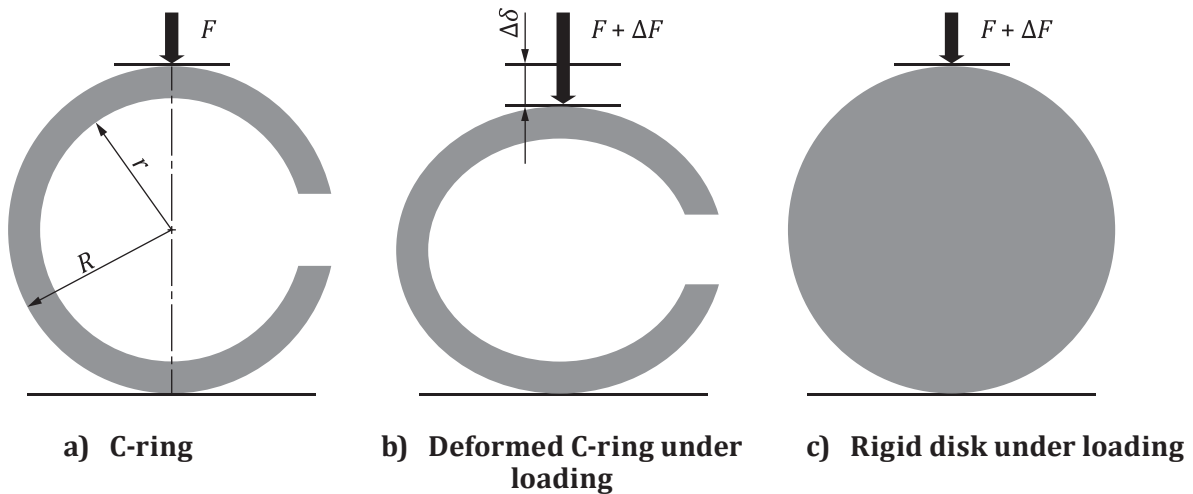


Figure 2 — Schematic diagram of C-ring and rigid disk, loading mode and deformation