



NSAI
Standards

Irish Standard
I.S. EN 1071-10:2009

Advanced technical ceramics - Methods of test for ceramic coatings - Part 10: Determination of coating thickness by cross sectioning

I.S. EN 1071-10:2009

Incorporating amendments/corrigenda issued since publication:

This document replaces:
S.R. CEN/TS 1071-10:2004

This document is based on:
EN 1071-10:2009
CEN/TS 1071-10:2004

Published:
15 July, 2009
29 September, 2004

This document was published
under the authority of the NSAI
and comes into effect on:
9 September, 2009

ICS number:
81.060.30

NSAI
1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie
W **NSAI.ie**

Sales:
T +353 1 857 6730
F +353 1 857 6729
W standards.ie

Price Code:
G

Údarás um Chaighdeáin Náisiúnta na hÉireann

English Version

Advanced technical ceramics - Methods of test for ceramic coatings - Part 10: Determination of coating thickness by cross sectioning

Céramiques techniques avancées - Méthodes d'essai pour les revêtements céramiques - Partie 10: Détermination de l'épaisseur du revêtement par découpage transverse

Hochleistungskeramik - Verfahren zur Prüfung keramischer Schichten - Teil 10: Bestimmung der Schichtdicke mittels Querschliff

This European Standard was approved by CEN on 19 June 2009.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword	3
Introduction	5
1 Scope.....	6
2 Normative references	6
3 Terms and definitions.....	6
4 Principle	6
5 Apparatus	6
5.1 Scanning electron microscope (SEM)	6
5.2 Optical microscope.....	6
6 Sample preparation.....	7
6.1 Cross-section preparation	7
6.2 Surface roughness.....	7
6.3 Taper of cross-section.....	7
6.4 Specimen tilt.....	7
6.5 Coating damage	7
6.6 Rounding of edges of the coating.....	7
6.7 Overplating	8
6.8 Etching	8
6.9 Smearing.....	8
7 Calibration of instruments	8
7.1 Procedure	8
7.2 Photography.....	8
7.3 Measurement	8
7.4 Calculation of magnification.....	8
7.5 Poor contrast.....	9
7.6 Magnification	9
7.7 Uniformity of magnification	9
7.8 Stability of magnification	9
8 Test procedure	9
8.1 General.....	9
8.2 Preparation of images	10
8.3 Measurement	10
8.4 Thickness calculation.....	10
8.5 Correction procedures	11
9 Measurement uncertainty	11
10 Expression of results.....	11
11 Report.....	11
Annex A (informative) General guidance on the preparation and measurement of cross-sections.....	13
A.1 Introduction	13
A.2 Cutting.....	13
A.3 Mounting	13
A.4 Grinding and polishing.....	14
A.5 Use of the scanning electron microscope.....	14
Bibliography	15

Foreword

This document (EN 1071-10:2009) has been prepared by Technical Committee CEN/TC 184 “Advanced technical ceramics”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2010, and conflicting national standards shall be withdrawn at the latest by January 2010.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes CEN/TS 1071-10:2004.

EN 1071 *Advanced technical ceramics — Methods of test for ceramic coatings* consists of the following parts:

- *Part 1: Determination of coating thickness by contact probe profilometer*
- *Part 2: Determination of coating thickness by the crater grinding method*
- *Part 3: Determination of adhesion and other mechanical failure modes by a scratch test*
- *Part 4: Determination of chemical composition by electron probe microanalysis (EPMA)*
- *Part 5: Determination of porosity [withdrawn]*
- *Part 6: Determination of the abrasion resistance of coatings by a micro-abrasion wear test*
- *Part 7: Determination of hardness and Young's modulus by instrumented indentation testing [withdrawn]*
- *Part 8: Rockwell indentation test for evaluation of adhesion*
- *Part 9: Determination of fracture strain*
- *Part 10: Determination of coating thickness by cross sectioning*
- *Part 11: Determination of internal stress by the Stoney formula*
- *Part 12: Reciprocating wear test ¹⁾*
- *Part 13: Determination of wear rate by the pin-on-disk method ¹⁾*

Parts 7, 8 and 11 are Technical Specifications. Part 7 was withdrawn shortly after publication of EN ISO 14577-4:2007.

¹⁾ In preparation at the time of publication of this European Standard.

I.S. EN 1071-10:2009

EN 1071-10:2009 (E)

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

The thickness of a coating is an important property that controls its functional behaviour. Thickness determinations are also used as part of quality control in the production of coatings. It is normal to specify a thickness when defining a coating, so that valid methods of measurement are required. The method described here is direct, but is destructive, requiring preparation of a metallographic cross-section. A number of other standard non-destructive methods exist and some of these are listed in the Bibliography (references [1] to [7]).

1 Scope

This document specifies a method of measuring the thickness of ceramic coatings by means of examination of a metallographically prepared cross-section of the coating in a calibrated optical or scanning electron microscope. It draws strongly on EN ISO 9220 [8], modifying and updating as required to be relevant to ceramic coatings and current best practice.

2 Normative references

The following referenced document is indispensable for the application 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.

ENV 13005, *Guide to the expression of uncertainty in measurement*

EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2005)*

3 Terms and definitions

For the purposes of this document, the following term and definition apply.

3.1

local thickness

mean of the thickness measurements, of which a specified number is made within a reference area [EN ISO 2064:2000] [5]

4 Principle

This test procedure covers the measurement of coating thickness by examination of a cross-section in an optical or scanning electron microscope. Preparation of the cross-section requires care to ensure that the total thickness is revealed and that when viewed it is normal to the axis of the microscope. After proper calibration of the microscope, it is a simple matter to determine the coating thickness from knowledge of the magnification used. This can be done directly using a modern measuring microscope, or indirectly from photographic images obtained from an optical or scanning electron microscope.

5 Apparatus

5.1 Scanning electron microscope (SEM)

The SEM shall have a spatial resolution of 50 nm or better. Suitable instruments are available commercially.

5.2 Optical microscope

The optical microscope shall have a spatial resolution of 500 nm or better. Suitable instruments are available commercially.

NOTE 1 Microscopes that incorporate a system to automatically record the XY coordinates are available and, if the stage movement has been calibrated, can be used directly to measure coating thickness without the need

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

-
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
 - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-