

Advanced technical ceramics — Methods of test for ceramic coatings —

Part 4: Determination of chemical composition by electron probe microanalysis (EPMA)

The European Standard EN 1071-4:2006 has the status of a
British Standard

ICS 81.060.30

National foreword

This British Standard is the official English language version of EN 1071-4:2006. It supersedes DD ENV 1071-4:1996 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee RPI/13, Advanced technical ceramics, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 15 and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 June 2006

© BSI 2006

ISBN 0 580 48519 6

Amendments issued since publication

Amd. No.	Date	Comments

English Version

Advanced technical ceramics - Methods of test for ceramic coatings - Part 4: Determination of chemical composition by electron probe microanalysis (EPMA)

Céramiques techniques avancées - Méthodes d'essais pour revêtements céramiques - Partie 4 : Détermination de la composition chimique avec analyse par microsonde électronique (EPMA)

Hochleistungskeramik - Verfahren zur Prüfung keramischer Schichten - Teil 4: Bestimmung der chemischen Zusammensetzung durch Elektronenstrahl-Mikrobereichsanalyse (ESMA)

This European Standard was approved by CEN on 30 December 2005.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, 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: rue de Stassart, 36 B-1050 Brussels

Contents

Page

Foreword.....	3
1 Scope.....	5
2 Normative references	5
3 Terms and definitions	5
3.1 General	5
3.2 Terms used in electron probe microanalysis	6
4 Principle	7
5 Apparatus and materials.....	8
5.1 General	8
5.2 Scanning electron microscope.....	8
5.3 Electron probe microanalyser	9
5.4 Energy dispersive spectrometer	9
5.5 Wavelength dispersive spectrometer	9
6 Preparation of test piece.....	9
6.1 General	9
6.2 Surface roughness	9
6.3 Surface conduction	10
7 Test procedure.....	11
7.1 General	11
7.2 Instrument conditions	11
7.3 Analysis of thin coatings	11
7.4 Analysis of thick coatings	12
7.5 Analysis of multilayer coatings	12
8 Accuracy and interferences.....	13
9 Test report.....	13
Bibliography	15

Foreword

This European Standard (EN 1071-4:2006) 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 August 2006, and conflicting national standards shall be withdrawn at the latest by August 2006.

EN 1071 *Advanced technical ceramics – Methods of test for ceramic coatings* consists of 11 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*
- 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*
- 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*

Parts 7 to 11 are Technical Specifications.

This European Standard supersedes ENV 1071-4:1995.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, 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.

Introduction

Electron probe microanalysis (EPMA) is a commonly used analytical technique which is applicable to a wide range of materials in bulk form. While international standards for this procedure have been developed under ISO/TC 202 'Microbeam analysis', currently no European or international standard considers the application of EPMA to ceramic coating analysis.

Terms and definitions, including those used in this European Standard that are not specific to this standard are given in ISO 18115 and in ISO 23833.

The composition of a coating is a critical factor determining the performance of a product, so this analytical procedure can be used in quality control, coating development, characterisation and for design data acquisition purposes.

Reference works on electron probe microanalysis are listed in the Bibliography [1, 2].