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Advanced technical ceramics - Test methods for determination of fracture toughness of monolitic ceramics - Part 5: Single-edge vee-notch beam (SEVNB) method

Céramiques techniques avancées - Méthodes d'essai pour la détermination de la résistance à la fracture des céramiques monolithiques - Partie 5: Méthode du faisceau à entaille en V sur bord simple (SEVNB)

Hochleistungskeramik - Prüfverfahren zur Bestimmung der Bruchzähigkeit von monolithischer Keramik - Teil 5: Verfahren für Biegeproben mit V-Kerb (SEVNB-Verfahren)

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Foreword

This document (CEN/TS 14425-5:2004) has been prepared by Technical Committee CEN/TC 184 “Advanced technical ceramics”, the secretariat of which is held by BSI.

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

CEN/TS 14425 *Advanced technical ceramics — Test methods for determination of fracture toughness of monolithic ceramics* consists of five parts:

Part 1: Guide to test method selection

Part 2: Single-edge pre-cracked beam (SEPB) method

Part 3: Chevron notched beam (CNB) (method

Part 4: Surface crack in flexure (SCF) method

Part 5: Single-edge V-notch beam (SEVNB) method

1 Scope

This part of CEN/TS 14425 describes a method for the determination of the fracture toughness of advanced technical ceramics. The procedure makes use of V-notched bars, which are loaded in 4-point bending until failure. It is applicable to ceramics with a grain size or major microstructural feature size larger than about 1 µm.

2 Normative references

The following referenced documents are 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.

EN 843-1, *Advanced technical ceramics — Monolithic ceramics — Mechanical properties at room temperature — Part 1: Determination of flexural strength*

ENV 1006, *Advanced technical ceramics — Monolithic ceramics — Guidance on the selection of test pieces for the evaluation of properties*

CEN/TS 14425-1, *Advanced technical ceramics — Test methods for determination of fracture toughness of monolithic ceramics - Part 1: Guide to test method selection*

EN ISO 7500-1, *Metallic materials - Verification of static uniaxial testing machines - Part 1: Tension/compression testing machines (ISO 7500-1:1999)*

EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:1999)*

ISO 3611, *Micrometer callipers for external measurement*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in CEN/TS 14425-1 apply.

4 Principle

This method of conducting a fracture toughness test is based on the preparation and fracture of bar test pieces in which a sharp-tipped notch is machined. Using the technique of a reciprocating razor blade and diamond paste, a narrow notch can be honed into a test piece using either a manual method or a simple machine. Under well-controlled conditions a notch tip radius in the range of 1 µm to 20 µm can be prepared depending on the grain size of the test material. For many materials this is a close approximation to a sharp crack, and the method has been found to give fracture toughness values very close to those of other methods such as the single-edge pre-cracked beam (SEPB) method (prCEN/TS 14425-2) or the surface crack in flexure (SCF) method (prCEN/TS 14425-4). The method has advantages of simplicity of notch production compared with using a sharp-tipped diamond saw or a diamond impregnated wire in which the tip radius is normally greater than 50 µm. The method is often easier to undertake compared with other methods of pre-cracking, and is applicable to a wider range of materials outside the scope of these other methods.