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IRISH STANDARD

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ICS 81.060.30

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ADVANCED TECHNICAL CERAMICS - CERAMIC COMPOSITES - MECHANICAL PROPERTIES AT ROOM TEMPERATURE, DETERMINATION OF ELASTIC PROPERTIES BY AN ULTRASONIC TECHNIQUE

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English version

Advanced technical ceramics - Ceramic composites - Mechanical properties at room temperature, determination of elastic properties by an ultrasonic technique

Hochleistungskeramik - Keramische Verbundwerkstoffe - Mechanische Eigenschaften bei Raumtemperatur, Bestimmung von elastischen Eigenschaften mittels Ultraschallwellen

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Foreword

This document (ENV 14186:2002) 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 European Prestandard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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1 Scope

This ENV specifies an ultrasonic method to determine the components of the elasticity tensor of ceramic matrix composite materials at room temperature. Young moduli, shear moduli and Poisson coefficients, can be determined from the components of the elasticity tensor.

This standard applies to ceramic matrix composites with a continuous fibre reinforcement: unidirectional (1D), bidirectional (2D), and tridirectional (xD, with $2< x \leq 3$) which have at least orthotropic symmetry, and whose material symmetry axes are known.

This method is applicable only when the ultrasonic wave length used is larger than the thickness of the representative elementary volume, thus imposing an upper limit to the frequency range of the transducers used.

NOTE Properties obtained by this method may not be comparable with moduli obtained by EN 658-1, ENV 658-2 and ENV 12289.

2 Normative references

This European Prestandard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Prestandard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ENV 1389, *Advanced technical ceramics – Composite ceramics – Physical properties – Determination of density and of apparent porosity.*

ENV 13233:1998, *Advanced technical ceramics – Composite ceramics – Notations and symbols.*

ISO 3611, *Micrometer callipers for external measurements.*

ISO 653, *Long-solid-stem thermometers for precision use.*

3 Principle

The determination of the elastic properties consists of calculating the coefficients of the propagation equation of an elastic plane wave, from a set of properly chosen velocity measurements along known directions.

A thin specimen with planparallel faces is immersed in an acoustically coupling fluid (e.g. water) – see Figure 1. The specimen is placed between an emitter (E) and a receiver (R) which are rigidly connected to each other and have two rotational degrees of freedom. Using appropriate signal processing, the propagation velocities of each wave in the specimen are calculated.

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