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Fine ceramics - Test method of elastic modulus, shear modulus and Poisson's ratio for ceramic at high temperature - Impulse excitation of vibration

精细陶瓷 高温弹性模量、剪切模量和泊松比试验方法 脉冲激励法

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting.

Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents.

This document was proposed by China Building Materials Federation.

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High temperature elastic modulus, shear modulus and Poisson's ratio test method Pulse excitation method

1 Scope

This document describes the principle, instrumentation, and methods of measuring the elastic modulus, shear modulus, and Poisson's ratio of fine ceramics at high temperatures using the pulse excitation method.

Equipment, specimens, test procedures, calculations and test reports.

This document is applicable to the determination of elastic modulus, shear modulus and Poisson's ratio of isotropic, continuous and homogeneous ceramic materials in high temperature environments.

It is used for reference for other isotropic, continuous, homogeneous, hard and brittle solid materials such as metals and glass.

2 Normative references

GB/T 1216

GB/T 16839.1

3 Terms and definitions

The following terms and definitions apply to this document.

3.1 Bending vibration

Vibration of the specimen in the normal direction of the length horizontal plane.

3.2 Torsional vibration

The specimen undergoes torsional vibration in the cross section around its length.

4 Principle

A pulse exciter is used to generate mechanical excitation on a rectangular cross-section sample in a high temperature environment, causing the sample to vibrate and measure the bending of the sample.

The fundamental frequency of the sample is obtained by fast Fourier transform, and the fundamental frequency of the bending vibration is used to calculate the Elastic modulus, shear modulus is calculated using the fundamental frequency of torsional vibration. Poisson's ratio is calculated from the relationship between elastic modulus and shear modulus.

Note. Since the fundamental frequency of the sample vibration is related to the sample size, mass and elastic modulus, when the sample mass and size are known, the fundamental frequency can be calculated after it is measured.

The elastic modulus is calculated from the bending vibration frequency, and the shear modulus is calculated from the torsional vibration frequency.

The elastic modulus and the shear modulus determine the strength of the material, and only two of the three are independent.