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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 44536-2024

**Test method for determining thermal expansion coefficient and
residual stress of CVD ceramic coatings**

CVD陶瓷涂层热膨胀系数和残余应力试验方法

(English Translation)

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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 is required.

This document is modified to adopt ISO 23458:2020 "Fine ceramics (advanced ceramics,

advanced technical ceramics) CVD ceramic coatings thermal expansion Test methods for coefficients and residual stresses.

The technical differences between this document and ISO 23458:2020 and their reasons are as follows.

The term in 3.2 of ISO 23458:2020 is changed from "linear thermal expansion coefficient" to "residual stress" due to the normative references Having explained the "linear thermal expansion coefficient", it is even more necessary for this document to define "residual stress" (see 3.2);

ISO 17139 was replaced by the normatively referenced GB/T 16535 to adapt to my country's technical conditions and increase operability (see

The normative reference GB/T 16839.1 replaced IEC 60584-1 to adapt to my country's technical conditions and increase operability (see 5.3);

Simplify the description of 5.4 in ISO 23458:2020 to "Install the specimen in accordance with the provisions of GB/T 16535" and use the standard as the basis.

Improve the standardization of operations (see 5.4);

ISO 3611 was replaced by the normative reference GB/T 1216 to adapt to my country's technical conditions and increase operability (see 5.6); -ISO 19603 was replaced by the normative references GB/T 39686 and GB/T 39828 to adapt to my country's technical conditions and increase the Operability (see 7.2);

The calculation of residual stress of CVD ceramic coating in 7.4 of ISO 23458:2020 has been deleted because it does not require test operation and is in 8.2.

It has been reflected.

The following editorial changes were made to this document.

To coordinate with the existing standards, the name of the standard is changed to "Test Method for Thermal Expansion Coefficient and Residual Stress of CVD Ceramic Coatings".

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1 Scope

This document describes CVD ceramic coatings (coating thickness greater than 0.03 mm and the ratio of coating thickness to total thickness of substrate and coating is less than 1/4) Test methods for thermal expansion coefficient and residual stress from room temperature to 2 300 K, and specify the sample preparation method, loading mode, loading Rates, data collection, and reporting formats.

This document is applicable to CVD ceramic coatings on metal substrates or ceramic substrates. This test method can be used for material performance research, quality control,

performance characterization and data acquisition.

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document.

For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies.

in this document.

GB/T 1216 Outside Micrometer GB/T 16535 Test method for linear thermal expansion coefficient of fine ceramics - Ejector method (GB/T 16535-2008, ISO 17562:2001, MOD)
GB/T 39686 Test method for elastic modulus and strength of thick ceramic coatings GB/T 39828 Test method for high temperature elastic modulus of thick ceramic coatings GB/T 16839.1 Thermocouples Part 1: Electromotive force specifications and tolerances (GB/T 16839.1-2018, IEC 60584-1.

2013, IDT)

3 Terms and definitions

The following terms and definitions apply to this document.

relative method

Parameters that cannot be measured directly are obtained through indirect methods.

Note: The unknown parameter A cannot be measured directly, but the parameters B and C are known or easy to measure. By establishing the analytical relationship $A=f(B,C)$, we can calculate Calculate parameter A.

residual stress

The self-balanced internal stress that remains in an object after external forces or uneven temperature fields are eliminated.

4 Principle

The deformation of the coating specimen during heating or cooling involves two influencing factors, namely the thermal expansion coefficient of the coating and substrate and the residual stress.

The thermal expansion coefficient is an intrinsic physical parameter of the material, while the residual stress of the coating depends on the intrinsic properties of the material, the size of the component and the relationship between the coating and the substrate.

The cross-sectional area ratio of the body.