

ICS 25.220.20

CCS A 29



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

GB/T 42259-2022

**Metallic and other inorganic coatings - Test methods for
measuring thermal cycle resistance and thermal shock
resistance for thermal barrier coatings**

Issued on: December 30, 2022

Implemented on: April 1, 2023

**Issued by: State Administration for Market Regulation, China National
Standardization Administration**

Table of Contents

Preface	
1 Scope	1
2 Normative references	1
3 Terms and Definitions	1
4 Principle	2
5 Test method	3
5.1 General	3
5.2 Test method for heat cycle performance	3
5.3 Test method for thermal shock resistance	8
6 Test report	11
6.1 General	11
6.2 Heat cycle performance test report	11
6.3 Thermal Shock Resistance Test Report	11
Reference	12

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.

This document is modified to adopt ISO 14188.2012 "Tests for thermal cycle and thermal shock resistance of thermal barrier coatings on metals and other inorganic coatings method".

Compared with ISO 14188.2012, this document has made the following structural adjustments.

--- Adjust Figure 2 in ISO 14188.2012 to Figure 2 and Figure 3, and adjust the other figure numbers accordingly.

The technical differences between this document and ISO 14188.2012 and their reasons are as follows.

--- The measurement requirements for the peeling area ratio have been increased [see 5.2.4.4a)] to improve the rationality of measuring the peeling area.

The following editorial changes have been made to this document.

--- Added quotations for items listed in 5.1, 5.2.4.2, 5.2.4.3, 5.2.4.4, 5.2.4.6, 5.3.3, 6.2, and 6.3;

---Change the titles of 5.2.2.1 and 5.3.2.1 of ISO 14188.2012 to the quotations of the column items.

Please note that some contents of this document may refer to patents. The issuing agency of this document assumes no responsibility for identifying patents.

1 Scope

This document describes two test methods for thermal barrier coatings, using a steady-state cyclic heating and cooling method to test the thermal cycle resistance, and using a heated

Thermal shock resistance is tested by heat and chill methods.

This document is used to evaluate the durability of thermal barrier coatings under thermal strain.

This document is suitable for screening thermal barrier coating systems including materials and processing techniques, and is not suitable for controlling thermal spraying processes.

2 Normative references

The contents of the following documents constitute the essential provisions of this document through normative references in the text. Among them, dated references

For documents, only the version corresponding to the date is applicable to this document; for undated reference documents, the latest version (including all amendments) is applicable to

this document.

ISO 14232 Thermal spraying powder composition and supply technical conditions (Thermalspraying-Powders-Composition

Note. GB/T 19356-2003 Thermal spraying powder composition and technical supply conditions (ISO 14232.2000, MOD)

strength)

Note. GB/T 8642-2002 Determination of thermal spray tensile bond strength (ISO 14916.1999, MOD)

3 Terms and Definitions

The following terms and definitions apply to this document.

3.1

A two-layer structural coating consisting of a metal bond layer and an oxide ceramic topcoat designed to reduce heat transfer from the ceramic topcoat to the substrate.

NOTE. Thermally grown oxide (TGO) will develop on top of the bond coat when the thermal barrier coating is in service at high temperatures. Typical substrate materials are nickel-based superalloys

material. As shown in Figure 1, the preparation method adopts physical vapor deposition, chemical vapor deposition or thermal spraying process, such as plasma spraying and high-velocity flame coating.

Flame spraying (HVOF), the spraying powder material complies with the provisions of the corresponding part of ISO 14232.