



FINAL DRAFT International Standard

ISO/FDIS 21465

Test method for CMAS corrosion of thermal/environmental barrier coatings under dynamic thermal cycling

ISO/TC 107

Secretariat: **KATS**

Voting begins on:
2024-12-04

Voting terminates on:
2025-01-29

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Published in Switzerland

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Introduction

This document provides the test method for calcia–magnesia–aluminosilicate (CMAS) corrosion of thermal/environmental barrier coatings (T/EBCs) under dynamic thermal cycling. The CMAS corrosion behaviour affects the performance and service life of the T/EBCs. The multi-layer structure of the T/EBC is deposited on Ni-superalloys/SiC-based ceramic substrates using different methods such as atmospheric plasma spraying (APS), plasma spray-physical vapour deposition (PS-PVD), electron beam physical vapour deposition (EB-PVD), high-velocity oxygen fuel (HVOF). Therefore, the deposition methods and thickness of T/EBCs should meet the requirements of service conditions.

CMAS can be in the form of airborne sand, runway debris or volcanic ash in aircraft engines and ambient dust or fly ash in power generation engines. Gas turbine engines are attacked by the CMAS when the aerospace spacecraft or aircraft flies above desert and volcanic areas. The diffusion, reaction and viscosity of the molten CMAS can cause serious corrosion of T/EBC, resulting in the T/EBC's spallation and failure. Consequently, the operation lifetime of the gas turbine is reduced. Therefore, the behaviour of CMAS corrosion of T/EBCs is an important assessment index of T/EBCs performance. A unified international test standard is required to evaluate CMAS corrosion of thermal/environmental barrier coatings (T/EBCs) under dynamic thermal cycling. This document aims to formulate a standardized and unified test method, including the process and the failure determination criteria, for the performance of T/EBCs.

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