~~2024-09-20~~

ISO/FDIS 21465~~: 2024(en)~~

ISO~~/~~TC~~ ~~107~~/N2906~~

Secretariat:~~ ~~KATS

Date: 2024-11-20

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

FDIS stage

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Published in Switzerland

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Foreword

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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 ~~the~~ desert and volcanic areas. The diffusion, reaction~~,~~ and viscosity of the molten CMAS ~~would~~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.