

Accepted Manuscript

Layered, composite, and doped thermal barrier coatings exposed to sand laden flows within a gas turbine engine: Microstructural evolution, mechanical properties, and CMAS deposition

Andy Nieto, Michael Walock, Anindya Ghoshal, Dongming Zhu, Blake Barnett, Muthuvel Murugan, Marc Pepi, Chris Rowe, Robert Pegg



PII: S0257-8972(18)30663-7
DOI: doi:[10.1016/j.surfcoat.2018.05.089](https://doi.org/10.1016/j.surfcoat.2018.05.089)
Reference: SCT 23539
To appear in: *Surface & Coatings Technology*
Received date: 20 March 2018
Revised date: 22 May 2018
Accepted date: 23 May 2018

Please cite this article as: Andy Nieto, Michael Walock, Anindya Ghoshal, Dongming Zhu, Blake Barnett, Muthuvel Murugan, Marc Pepi, Chris Rowe, Robert Pegg , Layered, composite, and doped thermal barrier coatings exposed to sand laden flows within a gas turbine engine: Microstructural evolution, mechanical properties, and CMAS deposition. Sct (2018), doi:[10.1016/j.surfcoat.2018.05.089](https://doi.org/10.1016/j.surfcoat.2018.05.089)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Layered, Composite, and Doped Thermal Barrier Coatings Exposed to Sand Laden Flows within a Gas Turbine Engine: Microstructural Evolution, Mechanical Properties, and CMAS Deposition

Andy Nieto^{a*}, Michael Walock^a, Anindya Ghoshal^{a*}, Dongming Zhu^b, William Gamble^c, Blake Barnett^c, Muthuvel Murugan^a, Marc Pepi^c, Chris Rowe^d, Robert Pegg^d

^a Vehicle Technology Directorate, US Army Research Laboratory, Aberdeen Proving Ground, MD, 21005, USA

^b Environmental Effects and Coatings Branch, NASA Glenn Research Center, Cleveland, OH, 44135, USA

^c Weapons and Materials Research Directorate, US Army Research Laboratory, Aberdeen Proving Ground, MD, 21005, USA

^d Power & Propulsion, US Navy Naval Air Systems Command, Patuxent River, MD, 20670, USA

Abstract

This study investigates several thermal barrier coating (TBC) architectural approaches for maintaining damage tolerance and attaining improved resistance to molten environmental particulate (i.e., CMAS) deposition. TBC approaches included an air plasma sprayed composite and layered coating, an electron beam-physical vapor deposition (EB-PVD) doped coating, and an EB-PVD bilayer doped coating. The TBCs were evaluated under sand laden combustion flows within a gas turbine engine. Scanning electron microscopy (SEM) and nanoindentation were used to characterize the microstructural and mechanical property evolution to understand the effects of the engine conditions on the various microstructural architectures and compositions investigated. The CMAS accumulation on each TBC is characterized and the nature of interaction at the TBC/CMAS interface was characterized by SEM, focused ion beam milling/imaging, and energy dispersive spectroscopy. An air plasma sprayed composite YSZ/Gd₂O₃ coating with a thin ~10 μ m Gd₂O₃ top coat performed the best, as it exhibited the lowest CMAS deposition and the least amount of structural damage.

Download English Version:

<https://daneshyari.com/en/article/8023369>

Download Persian Version:

<https://daneshyari.com/article/8023369>

[Daneshyari.com](https://daneshyari.com)