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Sand effects on thermal barrier coatings for gas turbine engines.[1]
MICHAEL WALOCK, BLAKE BARNETT, ANINDYA GHOSHAL, MUTHUVEL MURUGAN, JEFFREY SWAB, MARC PEPI, DAVID HOPKINS, GEORGE GAZONAS, US Army Rsch Lab - Aberdeen, KEVIN KERNER, US Army Aviation and Missile Research Development and Engineering Center — Accumulation and infiltration of molten/ semi-molten sand and subsequent formation of calcia-magnesia-alumina-silicate (CMAS) deposits in gas turbine engines continues to be a significant problem for aviation assets. This complex problem is compounded by the large variations in the composition, size, and topology of natural sands, gas generator turbine temperatures, thermal barrier coating properties, and the incoming particulate's momentum. In order to simplify the materials testing process, significant time and resources have been spent in the development of synthetic sand mixtures. However, there is debate whether these mixtures accurately mimic the damage observed in field-returned engines. With this study, we provide a direct comparison of CMAS deposits from both natural and synthetic sands. Using spray deposition techniques, 7% yttria-stabilized zirconia coatings are deposited onto bond-coated, Ni-superalloy discs. Each sample is coated with a sand slurry, either natural or synthetic, and exposed to a high temperature flame for 1 hour. Test samples are characterized before and after flame exposure. In addition, the test samples will be compared to field-returned equipment.

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