INVITED LECTURE

Thermal Barrier Coating for Improved High Temperature Oxidation Performance

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ABSTRACT

The present contribution concerns a detailed overview of thermal barrier coating for high temperature application. With a brief introduction of different ingredients of thermal barrier coating, the materials usually applied for bond coating and top coating will be presented. Finally, the recent development on compositionally graded thermal barrier coating will be presented. In addition, the research activities on high temperature oxidation behavior of compositionally graded yttria stabilized zirconia (YSZ) based thermal barrier coating (TBC) will also be presented. Duplex and compositionally graded TBCs consisting of 100% CoNiCrAlY as bond coat developed by high velocity oxyfuel (HVOF) spraying on Inconel 718 substrate Followed by several layers of CoNiCrAlY and YSZ in the weight ratios of 70:30, 50:50, 30:70, and 0:100 has been fabricated by plasma spray deposition technique. Followed by plasma spray deposition, detailed characterization of the microstructure of the coating has been evaluated. The oxidation behavior (both isothermal and non-isothermal) of the TBC coated Inconel 718 has been compared with the uncoated one by measuring the oxidation kinetics and mechanism in air at temperatures ranging from 900 °C to 1000 °C and subsequently, measuring the weight change per unit area and the thickness of thermally grown oxide (TGO) layer at an interval of 24 hours up to a maximum of 96 hours. The kinetics of oxidation was parabolic in nature for both in duplex and compositionally graded TBC. However, the TGO growth rate in compositionally graded TBC was found to be slower than duplex TBC between 900 °C to 1000 °C. The mechanism of oxidation was established.

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