EFFECTS OF CE ADDITIONS TO BOND COAT MATERIAL ON INTERFACIAL STRENGTH OF THERMAL BARRIER COATINGS

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Abstract

High-temperature coating systems, which were used in gas turbine engines, usually consist of a ceramic Thermal Barrier Coating (TBC) on top, an intermediate metallic Bond Coating (BC) and a superalloy substrate. It is usually used that yttria-stabilized zirconia (YSZ) as a top coating (TC) and CoNiCrAlY alloy as bond coating, respectively. During service, a Thermally Grown Oxide (TGO) layer grows at the interface between the TC and the BC. The TGO is predominantly comprised of β-Al2O3 and provides protection of the underlying substrate against high-temperature corrosion. However, upon cooling of the component from high temperature, thermal-mismatch strains can generate within the TGO. The elastic energy associated with these strains is the dominant driving force for failure of the coating systems. This strain energy increases with increasing TGO thickness. This explains that the failure of a high-temperature system can often be correlated with a critical TGO thickness at failure.

In this study, in order to control the TBC life, new bond coat materials with excellent interfacial strength for thermal barrier coatings was developed. By using Ce added bond coat material, wedge-like TGO was form at the interface between a top coat and a bond coat. As a result, interfacial strength was improved by the Ce added bond coat material.

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