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Thermal shock behavior of platinum aluminide bond coat/electron beam-physical vapor deposited thermal barrier coatings

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Abstract

Thermal barrier coating systems (TBCs) including of chemical vapor deposited (Ni, Pt)Al bond coat with grit blasting process and electron beam physical vapor deposited Y_2O_3-stabilized-ZrO_2 (YSZ) ceramic coating were investigated. The phase structures, surface and cross-sectional morphologies, thermal shock behaviors and residual stresses of the coatings were studied in detail. Grain boundary ridges still remain on the surface of bond coat prior to the deposition of the ceramic coating, which are shown to be the major sites for spallation damage initiation in TBCs. When these ridges are mostly removed, they appear some of cavities formation and then the damage initiation mode is deteriorated. Damage initiation and progression occurs at the bond coat to thermally grown oxide (TGO) interface leading to a buckling failure behavior. A buckle failure once started may be arrested when it runs into a region of high bond coat to TGO interface toughness. Thus, complete failure