DELAMINATION OF CERAMIC TOP COAT ACCELERATED BY CMAS IN AN EB-PVD THERMAL BARRIER COATING SPECIMEN

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Application of thermal barrier coatings (TBCs) which provides thermal insulation to the underlying Nickel-based superalloy substrate has been key technologies in advanced gas turbines. More recently, it has been recognized that the TBCs can be damaged by calcium–magnesium–alumino-silicates (CMAS) resulting from siliceous minerals (dust, sand, ash) containing the intake air and from unclean fuels such as a syngas and biomass gas. In this work basic mechanisms and mechanics as well as the kinetics, were explored, via a model CMAS, by specifying a TBC specimen which consisted of a Ni-base superalloy, MCrAlY bond coat and YSZ top coat fabricated by electron beam physical vapor deposition (EB-PVD) process. It was demonstrated that the penetration and the resultant phase transformation of the YSZ with the CMAS were basic mechanisms (Fig. 1(a)). It was a particular finding that the thickness of thermal grown oxide was significantly accelerated by CMAS at the top/bond coat interface, resulting in a predominant delamination of top coat (Fig. 1(b)). The behavior was discussed, in comparison with that in the TBC specimen fabricated by an air plasma spraying process (Fig. 1(c)).

![Fig. 1. CMAS damage evolution by CMAS in the EB-PVD specimen.](image)

(a) CMAS Damage (b) TGO growth accelerated by the CMAS (c) Comparison of TGO thickness between EB-PVDed and APSed specimen.