

FAILURE RESISTANT THERMAL AND ENVIRONMENTAL BARRIER COATING CONCEPTS

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Silicon-based ceramic matrix composites are rapidly eroded by the high temperature water vapor that is present in the combustion gases of advanced gas turbine engines. They must therefore be protected from erosion by prime reliant thermal and environmental barrier coatings. These coating systems typically use a silicon bond coat with a high Si-SiC interfacial toughness. This forms a silica thermally grown oxide (TGO) when exposed to oxidizing chemical species. The rate of TGO formation can be greatly reduced by use of a diffusion barrier layer with low oxidizer diffusivity. Ideally, the temperature of this layer (and thus its diffusivity) is reduced by means of a thermal barrier coating (TBC). Concepts for the deposition of these T/EBC systems will be described and their failure modes under simulated engine test conditions discussed. These insights are used to identify improved T/EBC designs that promise to lessen their risk of failure.