

MULTIFUNCTIONAL THERMAL BARRIER COATINGS ENABLED BY LAYERED MANUFACTURING

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Majority of contemporary TBCs applied either via plasma spray or EB-PVD can typically be described as monolithic single layers, principally based on yttria stabilized zirconia (YSZ). Advent of new ceramic compositions has necessitated to some extent the need for double layers where the interfacial ceramic layer on the bond coat is often made of YSZ to prevent reaction of advanced compositions with TGO. Even in these situation the coating architecture is generally of a single variant. Since TBCs experience location specific performance needs (example interfacial oxidation, sintering resistance in the volume and need for distinct surface characteristics to mitigate against CMAS and erosion) there is an opportunity to engender unique microstructural and material characteristics. In this presentation, we will discuss the coupling of multilayer coating design to meet the disparate coating needs along with advanced layered manufacturing concepts. Plasma spray is uniquely capable of taking advantage of such layered design concepts as the coating itself is built in discrete layers of particle based assembly. Several variants of such multilayer, multifunctional coatings will be presented incorporating guidance from mechanics model, manufacturing advances and performance attributes.