Effect of layer thickness on thermal shock behavior in double-layer micro- and nano-structured ceramic top coat APS TBCs

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ABSTRACT

The performance of thermal barrier coatings with the double-layer top coat in thermal shock condition has been investigated. Used powders to produce coatings are as follows: Yttria Stabilized Zirconia (YSZ, Y), Ceria-Yttria Stabilized Zirconium Oxide (CSE, C) and nano-structured YSZ (YSZ-N, YN). The samples were classified into four double-layer families, including Y-C, YN-C, YYN and YN-N. At the end of each cycle, samples were photographed, and the surface and edge damage were determined. Furthermore, scanning electron microscope (SEM) images and energy-dispersive spectrometer (EDS) analysis of sample's cross-section were taken before and after the test. After collecting experiment’s data, the effects of various factors on the outputs were checked. The results showed that YN, YN-Y and YN-C families, have the best performance, respectively. Moreover, it was found that using YSZ-N as the top layer, reduces the thickness of TGO, and it has a great effect on performance and the amount of damage.