CMAS-RESISTANCE OF A YITTRIA GRADED THERMAL BARRIER COATING FABRICATED BY PLASMA ACTIVATED EB-PVD

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EB-PVD yttria stabilized zirconia (YSZ) thermal barrier coatings (TBCs) are susceptible to calcia-magnesia-aluminum-silicate (CMAS) corrosion. The service lifetime of typical 8YSZ TBCs can be significantly reduced by CMAS attack. Currently, composition and microstructure modifications are the most commonly used methods for CMAS infiltration resistance. It has been reported by previous researchers that reactive elements, including Y, Gd, La, and etc., doped in TBCs can promote the formation of a dense protective layer by a sacrificing reaction with CMAS. It is therefore that the CMAS infiltration can be retarded. Besides, tailored columnar grains of TBCs are also proved to be effective for CMAS mitigation.

In this work, TBCs specimens with graded microstructure were fabricated by EB-PVD. The upper region of the TBC was doped with a higher Y$_2$O$_3$ content up to 25 wt.%, compared with the conventional 8YSZ composition. Besides, plasma activation was also introduced in the EB-PVD process to yield a tailored coating morphology and porosity. The coating specimens were tested at 1250 °C for evaluating CMAS resistance. Conventional YSZ coatings and graded coatings without plasma activation were also investigated for comparison.