

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

Hui Peng, School of Materials Science and Engineering, Beihang University (BUAA), No. 37 Xueyuan Road, Beijing, 100191, China
penghui@buaa.edu.cn

Shengkai Gong, School of Materials Science and Engineering, Beihang University (BUAA), No. 37 Xueyuan Road, Beijing, 100191, China

Yanling Pei, School of Materials Science and Engineering, Beihang University (BUAA), No. 37 Xueyuan Road, Beijing, 100191, China

Shusuo Li, School of Materials Science and Engineering, Beihang University (BUAA), No. 37 Xueyuan Road, Beijing, 100191, China

Hongbo Guo, School of Materials Science and Engineering, Beihang University (BUAA), No. 37 Xueyuan Road, Beijing, 100191, China

Key Words: CMAS; Thermal Barrier Coating; EB-PVD; Plasma activation

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_2O_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 prosity. 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.