EFFECTS OF EB-PVD MICROSTRURAL FEATURES ON CMAS INFILTRATION OF YTTRIA-RICH ZIRCONIA COATINGS

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The effects of the EB-PVD coating microstructural features such as column configuration, columnar gap, column width and feather arm length in the infiltration of yttria rich-zirconia TBCs (65 wt. % Y_2O_3 – ZrO_2 balanced) are discussed using different CMAS sources for infiltration. The results show that the microstructure plays a critical role in dictating the glass infiltration in addition to coating composition. In the studied coatings with wider columns and columnar gaps an increase in the permeability is generated leading to more prominent infiltration behavior. Conversely, coatings with thinner microstructural features exhibited the highest infiltration resistance. The utilization of surface treatment on multilayer coatings reduced CMAS infiltration by promoting parallel growth of columns enhancing coating permeability for efficient grass distribution and crystallization.

In addition to the influence of microstructural features on CMAS infiltration, the reaction is also controlled significantly by the microstructural distribution of feather arms and columnar gap width which shifts the chemical reaction locally. The results presented suggest that more open microstructural features change the amount of solute available to promote glass crystallization i.e. retarding or enhancing the potency to arrest CMAS infiltration. A detailed study on the effects of coating microstructure and growth with respect to the glass infiltration and coating dissolution mechanism is presented.