DENSE CERAMIC COATINGS DEPOSITED BY AEROSOL DEPOSITION FOR MULTILAYERED ARCHITECTURE TOWARDS THERMAL/ENVIRONMENTAL BARRIER COATINGS

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The demands for thermal/environmental barrier coatings (T/EBCs) have been increased as the operating temperature of gas turbines increased in harsh environment [1]. Multilayered and multifunctional coatings are required for advanced T/EBCs [2], varied from porous insulative layer to dense environmental barrier layer. Aerosol deposition (AD) method is a unique deposition method that enables the deposition of dense ceramic coatings with high adhesion strength without melting of injected powder based on room temperature impact consolidation (RTIC) phenomena [3-5]. Thus, it will be interesting to apply this process for T/EBC applications. However, in order to apply the AD method to these applications, the deposition rate and the ability of three-dimensional coverage should be improved. Mori et al. preliminary reported that the introduction of plasma assistance drastically improved the deposition rate for lead zirconate titanate [6]. Thus, it would be worth to try to enhance aerosol deposition by introduction of plasma assistance [7]. The use of mesoplasma flow, which is transitional state from thermal plasma to low-pressure plasma, is the key to the deposition [8]. Fine powder of 8-wt% yttria-stabilized zirconia was sprayed by an rf-inductively coupled plasma at a reduced pressure. The effect of plasma assistance was confirmed at the power input of several kilowatts, which was much smaller compared to conventional plasma spray. Coatings with uniform thickness of 5-20 μm was obtained. The Vickers hardness of the coating reached to 1200 HV. This coating will be useful for the architecture of multilayered advanced T/EBCs.

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