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Effects of Production Method and Heat Treatment on the Adhesion Strength and Microstructural Behavior of MCrAlY Coatings

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Thermal barrier coatings (TBCs) are widely-used as protective and insulative coatings on hot section components of gas turbines and their applications, like blades and combustion chambers, power generation. TBCs are used to allow higher service temperatures hot section of turbines and thus higher turbine efficiencies. TBCs generally consist of a metallic bond coating (BC) usually MCrAlY, a ceramic top coating (TC) usually ZrO2+Y2O3 and a thin oxide ceramic inter-layer (TGO) that forms under service condition within the bond coat / top coat interface. In this study, CoNiCrAlY powders were deposited on stainless steel substrate. High velocity oxy-fuel (HVOF) and Atmospheric plasma spraying (APS) techniques were used to produce two different types of bond coats. The ceramic top layers on both BC types were produced by APS. TBC specimens were subjected to heat treatment tests. Heat treatment tests was carried out in standard atmosphere at 550 °C, 650 °C and 750 °C for 1 and 2 hours. The microstructure and adhesion strength for top coat / bond coat interface of as sprayed and heat treated samples were investigated. Besides, the mechanical and microstructure behaviors of the produced layers in TBCs with heat treated and without heat treated samples were characterized and evaluated by XRD, SEM and optical microscope (OM). The results show the heat treatment of the coatings in different temperatures caused changes in microstructure and increase in adhesion strength properties of the coatings.

Keywords
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