

SESSION 4: WELDING AND COATING, SALON E

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Effect of post-treatment on micro-structure and properties of Al_2O_3 -13 wt% TiO_2 plasma-spray coating

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ABSTRACT

Al_2O_3 -13 wt% TiO_2 /NiCrAl (AT13) coating was prepared on Q235 steel substrate by air plasma spray process. Post-treatment of the sprayed samples was performed at the temperature range of 400–600°C in air with every 40°C interval. Bonding strength, porosity, phase analysis, and micro-structure characterizes before and after heat treatment were studied to investigate effect of heat treatment on properties of the samples. The results indicated that heat treatment in air could efficiently improve bonding strength of the coating-substrate and decreased porosity of the coatings; bonding strength and densification enhanced gradually with increasing treatment temperature at the range of 400–560°C; the sample heated at 560°C exhibited the best strength of 52.54 MPa and the lowest porosity of 3.01% in the whole series, and the strength was over two times than that of the sample before treatment. The reasons why strength of the samples was improved were mainly derived from sufficient element diffusion and the clamping effect between the coating-substrate at proper heating temperature resulted in a “strong” interface. However, higher heating temperature of 600°C was harmful to bonding strength of the coating-substrate, and the reasons were related to excessive oxidizing product FeO and oversized oxide layer in the interface.

KEYWORDS: element diffusion, bonding strength, air plasma spray, Al_2O_3 -13 wt% TiO_2 /NiCrAl coating, air heat treatment