

Plasma Spraying of 316 Stainless Steel on Aluminum and Investigation of Coat/Substrate Interface

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Abstract : By applying coating onto a structural component, the corrosion and/or wear resistance requirements of the surface can be fulfilled. Since the layer adhesion of the coating influences the mechanical integrity of the coat/substrate interface during the service time, it should be examined accurately. At the present work, the tensile bonding strength of the 316 stainless steel plasma sprayed coating on aluminum substrate was determined by using tensile adhesion test, TAT, specimen. The interfacial fracture toughness was specified using four-point bend specimen containing a saw notch and modified chevron-notched short-bar (SB) specimen. The coating microstructure and fractured specimen surface were examined by using scanning electron- and optical-microscopy. The investigation of coated surface after tensile adhesion test indicates that the failure mechanism is mostly cohesive and rarely adhesive type. The calculated value of critical strain energy release rate proposes relatively good interface status. It seems that four-point bending test offers a potentially more sensitive means for evaluation of mechanical integrity of coating/substrate interfaces than is possible with the tensile test. The fracture toughness value reported for the modified chevron-notched short-bar specimen testing cannot be taken as absolute value because its calculation is based on the minimum stress intensity coefficient value which has been suggested for the fracture toughness determination of homogeneous parts in the ASTM E1304-97 standard.

Keywords : bonding strength, four-point bend test, interfacial fracture toughness, modified chevron-notched short-bar specimen, plasma sprayed coating, tensile adhesion test

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