Low Pressure Gas Dynamic Spray Forming Near-net Shape Powder Parts

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Abstract

Thermal spraying processes are well known in the industry for providing relatively dense components. The Gas Dynamic Spray (GDS) technologies are a growing alternative, especially after the great success of certain applications such as plasma and thermal spray formed components. One of the advantages of the GDS is the possibility to obtain complex thin-walled shapes of various powder materials and composites. The optional post-spraying processes such as sintering, sizing and little machining may be applied. Using the low pressure radial injection GDS method, some new thin wall components have been formed. The process involves the automatic mechanical removal of sprayed ring components from a mould. Both the structure and properties of powdered material along with the GDS technology itself were studied. The main spraying and mould parameters were found to achieve high durability of moulds, which allowed the realization of a large scale GDS forming technology.

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An Empirical Method to Evaluate the In-flight Particle Behaviors within a Cross Section of Mass Flux during Atmospheric Plasma Spraying

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Abstract

In order to improve understandings of the coating formation in the plasma spraying, an empirical method, spot spraying bead formation, was designed. This study focused on the possibility for the proposed new empirical method to explain the microstructural inhomogeneity during the process. Two kinds of feedstock materials usually encountered in the thermal spraying process were used in this study. One was an alumina-titania composite feedstock and the other was a blended NiCr-Cr_2O_3-Ag-CaF_2/BaF_2 one. Based on the particle diagnostics using DPV-2000, two different plasma gas compositions were chosen to evaluate the plasma gas effect. Through the investigation for the spot spraying beads produced using different sets of feedstock and gas conditions, it could be confirmed that the microstructural inhomogeneities were largely dependent on the in-flight particle behaviors and they were also dependent on the trajectory within a cross section of mass flux.