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Effect of Substrate Type on Deposition Behavior and Wear Performance of Ni-coated Graphite/Al Composite Coatings Deposited by Cold Spraying

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Abstract

This work focused on the deposition characteristics and wear behavior of Ni-coated graphite mixed with 40 vol.% Al (Ni-Gr/Al) composite coatings sprayed on an Al alloy and a steel substrate by cold spraying (CS). The morphology of the flattened Ni-Gr particles was examined by single-impact tests. Cross-sectional microstructure and wear performance of the Ni-Gr/Al composite coatings were studied. Results showed that a larger number of Ni-Gr particles were finally bonded with the steel substrate, whereas many craters existed on the Al alloy substrate after the single-impact tests. The coating on the steel substrate had a high thickness, high graphite content and low coefficient of friction (COF) compared to those on the Al alloy substrate. In addition, the CS coatings presented a homogeneous distribution and uniform morphology of graphite, and a comparative COF to that of conventional thermal sprayed coatings. It was shown that CS could avoid the decomposition and transformation of graphite phase.

Keywords: Cold spraying; Ni-coated graphite; Deposition behavior; Microstructure; Wear performance

1. Introduction

Acting as one of abradable sealing coatings at intermediate temperature (up to 480 °C),