Development and Characterization of Cold Spray Coatings for Aerospace and Defense Manufacturing

Albert Alejandro and Javier A. Ortega
Department of Mechanical Engineering
The University of Texas Rio Grande Valley
Edinburg, TX 78539, USA
albert.alejandro01@utrgv.edu, javier.ortega@utrgv.edu

Anil Srivastava and Jianzhi Li
Manufacturing and Industrial Engineering Department
The University of Texas Rio Grande Valley
Edinburg, TX 78539, USA
jianzhi.li@utrgv.edu

Abstract

Cold Spray is a type of thermal metal spraying which uses heated gas/air to propel metal powder onto the surface of a substrate to create a coating or repair damaged or corroded metal components. The powder feedstock materials are spherical gas atomized metal powders ranging in size from 20-50 microns in diameter for best results. Cold spray systems use low temperatures ranging from 200-900 °C compared to existing additive manufacturing methods which use much higher temperatures to melt metal. These lower heating temperatures only semi-melt the metal powder particles allowing for them to undergo plastic deformation as they are deposited onto the surface of the substrate. The main objective of this project is to develop and characterize cold spray coatings using aluminum, copper, and nickel powders deposited on different substrates varying processing parameters. As cold spray can be used in different coating applications with a wide range of different metals and alloys, coatings have an unlimited range in applications where rapid repair and high-quality coatings are needed. The ease of use of this technology has a promising future in aerospace and defense applications as it provides a low-cost solution in corrosion prevention and repair of damaged components.

Keywords
Cold spray, additive manufacturing, coatings, repair, thermal spraying