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# Corrosion Resistance of Ni-Based Coatings deposited by Spray and Fuse Technique Varying Oxygen Flow

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## Abstract

In this work, Ni-based coatings were deposited, at four oxygen flow conditions, on grey cast iron substrates by the spray and fuse technique. The corroded coatings surfaces were studied by scanning electron microscopy (SEM) and their chemical composition was determined by proton induced X-ray emission (PIXE) and Rutherford backscattering spectrometry (RBS) analysis. Using powder X-ray diffraction (XRD) spectrometry the crystallographic structure and properties of the coatings were characterized.

The corrosion behavior of the Ni-based coatings and substrate were evaluated by potentiodynamic polarization using a NaCl 3.5 % solution. The chemical composition in the corrosion areas of the coatings showed that corroded zones are Cl structures. Finally, the study established a relationship between the crystallographic parameters and the corrosion resistance.

Keywords: Coatings, Spray and Fuse, Spectrometry, Backscattering, PIXE

## 1. Introduction

Coatings production by Thermal Spray is one of the techniques in the domain of surface coating used for the engineering and manufacturing of materials with particular properties that has most actively been studied and had technically advanced in the last decades. High Velocity Oxygen Fuel (HVOF), Detonation Gun, Arc spray and Spray and fuse are some of the techniques of thermal spray with greater interest in the scientific community mainly by the wide range of materials that can be deposited by these processes, versatility of the techniques to cover different geometries and relatively low cost of coatings [1,2,3]. The fuse powder spray technique can be divided in two process, one step spray and two step spray (spray and fuse). In one step spray the powder particles are heated to a molten or semi-molten state and then are propelled as droplets towards the substrate by a flow of compressed air forming a dense coating with a mechanical bonding within the substrate and coating. In the spray and fuse technique the powder is sprayed onto preheated substrate then the torch melts the powder onto the substrate forming a coating with metallurgical bonding with the substrate. In this mode, the crystallization process depends on the coatings production conditions, and the powder fusion process with the substrate.

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