

INFLUENCE OF THE LASER POWER ON THE GEOMETRY OF LASER CLADDING WITH NI BASE POWDER

Alexandru PASCU¹, Elena Manuela STANCIU¹, Ionut Claudiu ROATA¹,
Mircea Horia TIEREAN¹

¹Transilvania University of Brasov, Romania, e-mail: pascu.alex@yahoo.com

Abstract: *This paper addresses to the co-axial laser cladding of Metco 15E powder on medium carbon steel. The study aims to determine the laser power influence on the geometrical profile of the cladded tracks. Seven tests are made with constant increase of the power density and maintaining the same speed and powder feed rate. Cracks and pore free single tracks were fabricated. Very low dilution was obtained at all samples by using a defocused laser beam. The clad high, width, melt depth and HAZ is directly influenced by the laser power.*

Keywords: *laser cladding, dilution, NiCrBSi powder*

1. Introduction

Laser cladding is a very good method for recondition or to create new metallic surfaces. The laser cladding process uses a laser beam as thermal source and a filler material in form of wire or powder. The best method of laser cladding is by coaxial injection of the powder [1, 2]. New methods in powder fritting allowed the achievement of new alloys which proved to be suitable in order to perform coatings with high abrasive resistance. In the composition of these alloys, the main compound is nickel which makes a solid solution, chrome is the element that makes rough particles, boron and silicon give binary and ternary borides and silicates and together with nickel and chrome, decrease the melting temperature of the alloys and contribute to the de-oxidation process of the cladding zones [3].

The Ni based alloys are the most used alloy for reconditioning worn parts or as a hard facing layer. The Ni powders have the advantage to be feasible for mechanical mixing. Zhong et al. [5] has obtained good results in case of laser cladding with premixed C/Ni and pure W. WC particles with

rectangular or quadrangle cross-section shape with size of 2–30 μm were obtained by this method. An composite coatings Ni-WC is fabricated by Zhou [4] by laser induction hybrid rapid cladding. Using an inductor he obtains crack free ceramic-metal coatings with an even distribution of carbides. The Ni-Cr-B-Si alloy can produce hardfacing coating without the addition of WC witch increase the cracking susceptibility. Laser cladding with NiCrBSi was investigated in several studies [6, 7, 8], the main goals being the decreasing of cracking susceptibility, the improvement of the dilution effect and the enhancement of the wearing capabilities of this alloy. The laser cladding process is influenced by numerous parameters like power, cladding speed, powder feed rate, spot diameter, laser beam profile, flow rate of the assist gas, stand-of distance, dimension and geometry of the powder. To obtain a high quality cladded layer the process optimization is necessary by defining the influence of each parameter on the mechanical properties of the obtained surface. In the present study is investigated the influence of the powder density on the geometry profile of NiCrBSi laser cladding single tracks.