DISSIMILAR LASER WELDING OF CARBON STEEL AND STAINLESS STEEL

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Abstract: *This paper addresses to the laser welding of dissimilar materials. AISI 1010 and AISI 304 thin sheets are laser welded in lap joint geometry. The experimental tests were conducted using an Nd:Yag laser with wavelength in the near infrared field. The welded samples present a good geometry profile without pore or positioning defects. The mechanical behavior is investigated by means of micro-hardness analyses and tensile testing. Good tensile results were obtained as the specimens were fractured on the low carbon steel side.*

Keywords: *laser welding, tensile testing, stainless steel*

1. Introduction

Laser welding of dissimilar materials is a good method to design new components with improved mechanical proprieties and in the same time with a lower cost. Due to the new developments of the laser technology now can be successfully welded materials like of steel–kovar, copper–steel and copper–aluminium [1], cooper steel[2] or copper-aluminum [3].

If the dissimilar materials are metallurgical incompatible then a filer material in the form of cold wire may be used to create a diffusion zone between the base materials. Chen et all. [4], obtained good results in case of Ti-Al welding by using an Al-Si flux-cored wire as filler material. Hard to weld materials like NiTi shape-memory alloy can be jointed in dissimilar configuration by using laser technology. In a recent study Mirshekari [5] has weld NiTi alloy with stainless steel AISI 304. He obtained 63% of the ultimate tensile strength of the as-received NiTi material but concludes that further investigations are necessary to decrease the formation of brittle intermetallic formation in the weld zone.

In case of dissimilar welding the most used combination is the carbon steel to stainless steel. This material coupling raises difficulties in case of laser welding because of the microstructure transformation under the intense thermal gradient. Laser spot welding of low carbon and austenitic stainless steel was investigated by Torkamani [6]. Was determinate that at high laser power the welding mode are chanced from conduction to keyhole and influence the shape, dimension and structure of the weld bead.

Using the same material coupling but in continuous welding technique [7] reveals that tensile properties in this case are equal with the tensile of the carbon steel.

Serizawa et all. [8] has successfully weld F82H (ferritic/martensitic steel) to stainless steel using an 4 kW fiber laser. In this particular case, a post weld heat treatment was necessary to softening the heat affected zone and the weld bead. Because of the complex phenomena that occurs during laser welding are necessary further investigations in this direction. In this study is investigated the mechanical behavior of carbon steel – stainless steel laser welded in a lap joint geometry.