

# **Laser Welding of Dissimilar Materials (Stainless Steel 316L to Titanium Ti-6Al-4V)**

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# **LASER WELDING OF DISSIMILAR MATERIALS (STAINLESS STEEL 316L TO TITANIUM TI-6AL-4V)**

**By**

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**January 19, 2014**

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To my parents.

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## Abstract

Laser butt welding of stainless steel 316L and titanium alloy Ti-6Al-4V was performed. First, beads on plate welds on 1mm thick steel and titanium plates were performed using 650W CO<sub>2</sub> laser at speed ranging from 100 mm/min to 300 mm/min. It was observed that weld width and depth was decreased by increasing the scan speed at constant laser power. Effect of micro hardness on heat affected zone and weld zone was investigated. Micro hardness results showed hardness to be higher in weld zone of titanium and heat affected zone of stainless steel. Secondly, effect of laser welding using CO<sub>2</sub> laser of power of 650W on fracture behavior and microstructure of titanium and stainless steel was investigated with autogenous welding and with fillers (Copper, Aluminium and Nickel). Micro structure of the base plate, heat affected zone and weld zone was analyzed using optical microscope. Micro hardness of the joint was also investigated. Micro hardness results showed higher hardness values in weld zone as compared to base metal. Maximum hardness achieved was in autogenous welding of SS-Ti with 610 DPH. Uneven distribution of brittle intermetallic compounds resulted in spontaneous fracture of joint. The brittle intermetallics FeTi and FeTi<sub>2</sub> wasn't able to be suppressed by using power of 650W and scan speed of 300 mm/min. Filler materials also didn't help in achieving a successful joint. By increasing the laser power, scan speed, offsetting the laser on stainless steel and increasing thickness of filler materials used may result in successful joint.