# Numerical simulation of dissimilar laser welding of titanium and AISI304 steel parts

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Laser welding of titanium Grade 2 and AISI304 steel parts is commonly used in industries such as aerospace, automotive. These two metals have unique characteristics that make them ideal for various applications, but their differences in thermal conductivity, melting points, and chemical composition make achieving a strong and durable joint challenging [1].

Numerical simulation plays a crucial role in understanding and optimizing the laser welding process. By using numerical simulation is possible predict the behavior of the weld pool, heat distribution, and residual stresses in the welded material. This allows for the optimization of process parameters such as laser power, welding speed, and focal spot size to achieve better weld quality and efficiency [2].

This article focuses on analysing the temperature fields during the laser welding of 2 mm thick plates of AISI 304 steel and Ti Grade 2 through numerical simulations using ANSYS software. A simulation model for producing butt joints was developed to evaluate the impact of laser welding parameters, including laser power, welding speed, and laser beam offset towards the AISI 304 side, on temperature distribution and weld-pool characteristics. The laser heat source was modeled using a conical model with a Gaussian distribution of laser beam power. Material properties of AISI 304 steel and Ti Grade 2 were calculated as a function of temperature using JMatPro software. Cooling of the welding plates via convection and radiation with the argon shielding gas and surrounding air was applied using a third-kind boundary condition. Subsequently, the simulation model was employed to design appropriate technological parameters for laser welding these dissimilar metals. Using the DoE (Design of Experiment), the influence of technological parameters such as welding speed and laser power on the size of the melted zone on the top and bottom of the weld was analyse. An optimization was carried out, on the basis of which the area of optimal parameters for creating a weld with good quality was designed [3].

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