

## **A study of the hot cracks formation on T-joints of AA6013-T4 aluminum alloy welded by a Yb: fiber laser**

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Hot cracks, porosity and undercuts are common defects seen in bead welds influencing the mechanical joint behavior. The most harmful defect is the hot cracking that may be controlled by processing parameters, such as welding energy distribution and welding speed. This work studied the influence of the welding speed on the hot crack formation for the aeronautical aluminum alloy AA6013. Sheets with 1.6 mm thickness were welded without filler metal by a continuous wave Yb: fiber laser. The laser power was varied between 800 and 1800 W and the welding speed varied between 17 and 100 mm/s. The laser beam was focused on the joint. The weld was made in a single side of the joint with a 12° angle. Helium was used as process gas with a flow rate of 20 l/min. The microstructure analyses were made by optic microscopy and scanning electron microscopy. The microstructural analyses indicated that the weld beads made with the speed 100 and 50 mm/s showed hot cracks, although it was not observed porosities and undercut. For the speed of 17 mm/s, it is observed undercut and porosities defects, but there is no crack formation. The hot cracks were formed during solidification of the weld pool, due the segregation process that cause decrease on the solidification temperature of the residual interdendritic liquid. When this liquid solidifies there is a solid contraction causing the hot cracks, however the solidification rate and the consequent formation of hot cracks may be controlled by the process parameters.