

# Microstructure and residual stresses in Ti-6Al-4V alloy pulsed and unpulsed TIG welds

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**Abstract:** Increasing the pulse frequency in pulsed Tungsten Inert Gas arc welding refines the prior- $\beta$  grain size in the fusion zone of Ti-6Al-4V compared to unpulsed arc welding. The microhardness increases in the fusion zones obtained with pulsed welding mode, with respect to this microstructural evolution. The increase of the pulse frequency contributes to the formation of a more important amount of residual phase in the fusion zone which is accompanied by a decrease of microhardness. The tensile residual stress (RS) level in the pulsed process is lower than the one of the unpulsed process. The tensile RS induced by both welding processes in the HAZ are found to decrease when increasing the pulse frequency. In the fusion zone, the transversal RS are of compressive type for both processes whereas the longitudinal ones change from tensile to compressive type when increasing the pulse frequency.

**Keywords :** Ti-6Al-4V alloy, welding, pulsed current, microstructure, residual stress.