

Evaluation of residual stresses in titanium alloy welded by tig using ultrasonic method and effect of the microstructure on the lcr elastic wave

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Abstract : This study consists to determine the superficial residual stresses on Ti-6Al-4V titanium alloy sheets ($e = 2$ mm) welded by Tingsten Inert Gaz (TIG) process. The residual stresses can increase the fatigue cracks propagation. We will focus in the method of measurements based on ultrasonic using longitudinal critically refracted (Lcr) waves. This method is based on the acoustoelastic effect, which measure the velocity variation of the elastic waves according to the stress state of the material. This can be achieved through a calibration test to determinate the acoustoelastic coefficient (K). The results show a tensile stresses in the melted zone (MZ), heat affected zone (HAZ) and compression stresses in base metal (BM). The microstructure effect acts on the acoustoelastic constant K. The correction of t_0 corrects the overestimated residual stresses in the (HAZ) and (MZ).

Keywords : Titanium alloy, welding, residual stresses, Ultrasonic, microstructure