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CARACTERISATION OF AA7075-T6 ALUMINIUM ALLOYS WELDED BY FSW PROCESS

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Abstract : Friction stir welding (FSW) is a solid-state joining process that was invented in 1991 at The Welding Institute in the United Kingdom and has seen remarkable grown in research, development and application in recent years. It's a relatively new joining process that has been demonstrated in a variety of metals, suchas steel, titanium, lead, copper, and aluminum. The process is especially advantageous for joining aluminum and has been exploited commercially around the world in several industries [1]. FSW of butts joints is obtained by plunging a rotating, non-consumable welding tool into the joint, then traversing the rotating tool along the joint [2]. The majority of treatment (Mechanical, thermal or thermochemical processing) and industrial processes load to residual stresses. These lastexert a significant effect on fatigue properties, so the crack growth is detected by the residual stress and in complement by their microstructure. As the FSW is a solid state process, it is characterized by the absence of melting because of the low temperature compared to fusion weld. It is for this reason; the residual stresses are thought to be much lower. But, the very rigid clamping arrangement used, to maintain the sheets during the FSW welding, induce to significant rise in residual stresses. These restraints create a contraction of the weld nugget and heat-affected zone during cooling in both longitudinal and transversedirections, thereby resulting in generation of longitudinal and transverse stresses. Therefore, it is very important to determinate the residual stress in the FSW welds [3]. In the present work, we present results of residual stress, microstructures and microhardeness measurements of 2.6 mm thick plates of AA7075 in T6 heat treatment condition joint by friction stir welded. We shall be interested in the ultrasonic technique to determine residual stresses. This method has the advantage ofbeing easy to implement, nondestructive, inexpensive and fast [3, 4]. Its principle is based on the acousto-elastic phenomena, which consists to measure the velocityvariation of ultrasonic wave according to the stress state. This can be achieved through a calibration test. The results show a higher residual stresses inthe heat affected zone. Small compressive residual stresses were detected in the parent metal adjacent to the HAZ and the nugget zone. The microstructure reveals very fine grains in the weld zone compared to base metal

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