

Effect of Shot Peening on the Mechanical Properties for Welded Joints of Aluminium Alloy 6061-T6

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Abstract : This work aims to study the effect of shot peening on the mechanical properties of welded joints which performed by two different welding processes: Tungsten inert gas (TIG) welding and friction stir welding (FSW) processes of aluminum alloy 6061 T6. Arc welding process (TIG) was carried out on the sheet with dimensions of (100x50x6 mm) to obtain many welded joints with using electrode type ER4043 (AlSi5) as a filler metal and argon as shielding gas. While the friction stir welding process was carried out using CNC milling machine with a tool of rotational speed (1000 rpm) and welding speed of (20 mm/min) to obtain the same butt welded joints. The welded pieces were tested by X-ray radiography to detect the internal defects and faulty welded pieces were excluded. Tensile test specimens were prepared from welded joints and base alloy in the dimensions according to ASTM17500 and then subjected to shot peening process using steel ball of diameter 0.9 mm and for 15 min. All specimens were subjected to Vickers hardness test and micro structure examination to study the effect of welding process (TIG and FSW) on the micro structure of the weld zones. Results showed that a general decay of mechanical properties of TIG and FSW welded joints comparing with base alloy while the FSW welded joint gives better mechanical properties than that of TIG welded joint. This is due to the micro structure changes during the welding process. It has been found that the surface hardening by shot peening improved the mechanical properties of both welded joints, this is due to the compressive residual stress generation in the weld zones which was measured using X-Ray diffraction (XRD) inspection.

Keywords : friction stir welding, TIG welding, mechanical properties, shot peening

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