

Effect of filler composition on microstructure and mechanical properties of MIG welded AA6061 and AA7075

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ABSTRACT

Nowadays, aluminium alloy is hugely applied in the automotive and aircraft sector due to its lightweight and considerable hardness. For joining aluminium alloys, fusion welding methods are widely used due to its low cost. Apart from that, Metal Inert Gas (MIG) was generally applied by welders. Be that as it may, different filler compositions utilised in MIG welding dissimilar aluminum alloy can create a different microstructure, and defect happens during welding and influencing joint microstructure, and mechanical properties. The aim of this study is to identify the weldability, study the mechanical properties and investigate the effect of alloy element on microstructure of joining aluminium alloy AA6061 and AA7075. In order to achieve comparable welded quality and appearance, the welding parameters used for all setup must be the same. Four different types of filler metal were used, which were ER4043, ER4047, ER5183 and ER5356. For Vickers hardness and tensile test, a few samples from the welded specimens will be cut by using EDM wire cut machine, following the ASTM-E8 standard. The microstructure will be analysed using the same sample used for the hardness test. Meanwhile, for tensile test result, the ultimate tensile strength (UTS) of filler ER4047 with 13% silicon is the highest, 170.2 MPa, followed by filler ER5356 with 5% magnesium, 161.8 MPa, slightly decreased by filler ER4043 with 6% silicon and ER5183 with 4% magnesium are 159.78 and 159.6 MPa. All samples are fracture at AA6061 side for the hardness test. Base metal (BM) AA6061 gives a lower value than the heat affected zone (HAZ) and fusion (FZ) of both materials. The variations in the grain structure are seen by the microstructures of welded joints. By visual inspection, the defects presented in the welded joint were detected from its macrostructure.

KEYWORDS

MIG welding; Aluminium alloy; Different filler; Joining process; Automotive

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