Effect of Sc Addition to the Microstructure and Mechanical Properties of 7039 Aluminum Alloy Welds

鍾延徽、廖芳俊

E-mail: 9806495@mail.dyu.edu.tw

ABSTRACT

This study aims to investigate the effect of adding different amount of scandium in 7039 aluminum alloy by TIG welding processes and carry out heat treatment or not. To analyze the relationships between scandium content、microstructure and mechanical properties. From experimental results shown that, the scandium content in welds will not affect the mechanical properties when no heat- treatment. Once the weld with adequate heat-treatment, with every 0.1 wt.% scandium content increased, the grain size will reduce about 0.56 μm. However, the scandium content exceed 0.7 wt.%, the grain size will not further distinctly decreased. The micro-hardness and tensile strength have the similar trend, as scandium content increased, these properties will increase first and then gradually flat away. To survey the fracture surface of weld specimens with or without heat-treated. We found that the specimen with heat-treated did exist more dimple structure than the specimen without heat- treated. Therefore, the scandium added in the heat-treated welds will help to promote the elongation and toughness value. At 0.7 wt.% scandium content weld, carry out with 465 ℃、2 hours solid solution treatment and followed by 105℃、7 hours aging treatment, the grain refinement effect most effective, which will result in micro-hardness and tensile strength obviously increase.

Keywords : 7039 Aluminum Alloy、Scandium Content、TIG welding、Aging Treatment、Mechanical Properties

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