Effect of heat treatment on the grain structure and mechanical properties of Al-7075 friction stir weld

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(Received 3 May 2016 ; Accepted 5 June 2016)

Abstract
The fine grain structure of friction-stir welded aluminum alloys is unstable during post weld heat treatment and some grains abnormally grown. In this study, the sequence of abnormal grain growth during T6 heat treatment of Al-7075 alloy was investigated. The effect of heat treatment on the grain growth and mechanical properties of the weld zone was studied by using optical microscopy and microhardness tests. It was found that the fine grain structure of the weld zone is stable during T6 heat treatment and no abnormal grain growth was observed. The mechanical properties of the weld zone were also improved after T6 heat treatment. The results of this study can be used to optimize the heat treatment process of friction-stir welded aluminum alloys.

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treatment of Al-7075 friction-stir weld and its effect on mechanical properties of the weld was studied. The results showed that heat treatment in 510 °C resulted in drastic grain growth in stir zone and fine equiaxed grains in the stir zone of as-welded joint were substituted by millimeter-scale irregular grains. Post weld heat treatment resulted in decrease in the tensile elongation from about 10% to 1.5% although the joint tensile strength improved by 28%. In addition, post weld heat treatment changed the fracture location from the heat-affected zone to the stir zone.

**Keywords:** Friction-stir welding, Al-7075, Microstructure, Abnormal grain growth, Mechanical properties.