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

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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 was studied. The grain size distribution of the weld metal and the heat-affected zone was investigated in detail by optical microscopy. The results showed that the grain size of the weld metal increased significantly after the T6 treatment, indicating a coarsening of the microstructure. The grain size distribution was found to be uniform throughout the weld cross-section, and no significant variation was observed.

Keywords: Al-7075 friction weld, grain growth, T6 heat treatment, mechanical properties.
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.