

MORPHOLOGICAL AND STRUCTURAL STUDY OF FRICTION STIR WELDED THIN AA6061-T6 SHEETS

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ABSTRACT

Friction stir welding is performed on 2mm thick aluminum AA6061-T6 plates. The tool designed was of 10mm shoulder diameter and 1.7mm pin length. The tool rotation speeds were 900 rpm, 1120 rpm, 1400 rpm and 1800 rpm at a constant traverse speed of 125 mm/min. At all these tool rotation speeds defect free welds are successfully obtained. The results suggest at higher rpm, the welds exhibit very smooth surface morphologies. The grain size in the stir zone (SZ) is smaller than that in the base metal due to grain refinement. The hardness value at the weld zone is found less compared to base metal since the alloy is a heat treatable one as expected. The hardness can be regained to a good extent using suitable heat treatments. The hardness profile showed a substantial reduction in hardness in the heat affected zone (HAZ) especially in advancing side due to grain coarsening. Tensile test is done and the results show low tensile strength in weld metal compared to a base metal. Tensile strength of weld found increasing, according to an increase in the percentage of the first mode metal transfer.

KEYWORDS: Friction Stir Welding, Heat Affected Zone, Macro Structure, Micro Structure, Mode Metal Transfer, Onion Ring, Weldability