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Letters

Effect of tool eccentricity on the properties of friction stir welded AA6061 aluminum alloys

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ABSTRACT

This paper investigates the effect of tool eccentricity on material flow of friction stir welded (FSW) AA6061 aluminum alloy. Samples were butt joined using a threaded conical shaped tool pin with 1200 rpm rotational speed and 63 mm/min travel speed with and without 0.2 mm tool offset. A 0.1 mm thin Al foil was inserted at the faying surface prior to welding process to enhance the observation of faying surface material flow. Results show that tool eccentricity enhances nugget zone's material flow. Evidence show upward and horizontal expansion of the soft region in the nugget zone due to the eccentric setup. In addition, the pin-driven region of the nugget zone experiences increased softening with the soft region expanding upwards owing to the eccentric setup. However, tensile tests have shown minimal effect of the tool eccentricity to the strength and elongation of the weld joint. It can be concluded that the tool eccentric motion due to the 0.2 mm tool offset can enhance material flow in the nugget zone and expand the soft region of the nugget zone, but has shown no effect on the mechanical properties of AA6061 alloy.