

Effect of pin tool flute radius on the material flow and tensile properties of dissimilar friction stir welded aluminum alloys

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ABSTRACT

Tool design plays an important role in the development of dissimilar friction stir welding. This paper presents a design study of the welding tool through investigating the effect of pin flute radius during the friction stir welding of dissimilar AA7075-T651 and AA2024-T351 aluminum alloys. Five pin tools with different flute radii (0, 2, 3, 6, and ∞ mm) were inspected under 900 rpm spindle speed and 150-mm/min traverse rate, taking the position of base materials on the advancing and retreating sides of weld into account. The metallographic analysis and tensile properties of the welding joints were presented and discussed. The results clarified that the flute radius affects the material flow pattern and weld quality. The strongest joint was produced using the welding pin tool with a flute of radius equals to that of the pin, regardless of the relative materials position.

KEYWORDS:

Aluminum alloys; Friction stir welding; Material flow; Tensile properties; Tool design