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Special welding parameters study on Cu/Al joint in laser-heated friction stir welding

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Abstract

Effects of varied pin offset on microstructure and mechanical properties of joints were studied during laser-assisted friction stir butt welding between 6061T6 aluminum alloy and commercially pure copper. A suitable laser power was firstly selected by investigating the effect of laser power on the temperature field of the welding. The experiments were conducted with laser power of 700W, rotational speed of 950 rpm and welding speed of 23.5 mm/min while the pin tool offset distances differed from 0.2mm to 2.1mm and the tensile properties were tested respectively. EDS and SEM were adopted to analyze the inter-metallic compounds (IMCs) and microstructure of the joint interface. Inter-metallic compounds of Cu_3Al_2 , CuAl , CuAl_2 were observed in stir zone. $\alpha\text{-Al/CuAl}_2$ eutecticum and saturated solid solution of Cu in Al were detected in Al matrix. The pin offset distance and the additional heat source of laser beam play significantly important roles in the tensile strengths of the Cu/Al dissimilar joint. Reliable joints with thin IMC layers can be obtained when the laser power is 700W and the pin offset distance is 1mm.

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