INVESTIGATIONS ON THE PARAMETRIC EFFECTS OF ULTRASONIC WELDING PROCESS ON METALLOGRAPHIC ASPECTS OF Al-Al ALLOYS JOINTS

N. M. Raj[1,2], L.A.Kumaraswamidhas[2], S. A. Vendan[3*]

[1] Department of Mechanical Engineering, Sri Krishna College of Technology, Coimbatore
[2] Department of Mining Machinery Engineering, Indian School of Mines, Dhanbad
[3]School of Electrical Engineering, VIT University, Vellore
[*]Corresponding author: arungalaisv@yahoo.co.in

ABSTRACT

The welding characteristics of aluminium alloy 6061 wires of 0.5 mm thickness by a 15 kHz ultrasonic butt welding system were investigated. There is specific welding data available exclusively for these thin specimens, although the welding of these materials is imperative due to anticorrosive characteristics not only for large specimens, but more prominently for small electronic parts. Several experimental trials were conducted and observations were recorded as a database that collated parametric, quality and strength aspects of various weldments. These specimens of 0.5mm thickness were welded end to end, using a 15 kHz ultrasonic butt welding equipment with a vibration source with eight bolt-clamped transducers and a 50 kW power amplifier. The aluminium alloy specimens electrolytically polished were joined and weld strength almost equal to the material strength was achieved, under rather large vibration amplitude of 25 μm (peak-to-zero value), static pressure of 70 MPa and welding time of 1.0–3.0 s. The hardness of aluminium alloy specimen, adjacent to the weld surface, increased by about 20% by ultrasonic vibration. Destructive testing and metallurgical characterizations were carried out to examine the strength and integrity of the welded joint. The key focus of this research attempt is laid on determining and evaluating the factors that alter the weld strength. Metallurgical characterizations reveal vital information on the micro-structural modifications in the joints performed by ultrasonic welding.

KEYWORDS: ultrasonic, wire, alloys, aluminium, FEM.

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