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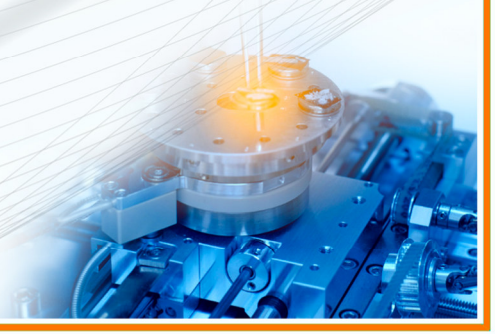

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Characterization of Friction Welded Joints between AA 2017A Aluminum Alloy and AISI 316L Stainless Steel

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ABSTRACT

The joining of dissimilar metals, such as aluminum and steel, has received considerable attention in modern industry due to its ability to reduce weight, enhance energy efficiency, and promote environmental sustainability. Among modern welding processes, rotary friction welding (RFW) is a very effective process for joining dissimilar materials. In this solid-state process, welding heat is generated through mechanical friction between a rotating workpiece and a stationary one. The properties of RFW joints are influenced by parameters such as welding time, applied pressure, and rotational speed. This experimental study explores how variable rotational speed affects the thermal behavior and mechanical properties of dissimilar joints between AISI 316L stainless steel and AA 2017A aluminum alloy produced by RFW process. The welding was performed using a milling machine as a rotary friction stir welding machine with varying the rotation speeds across the different welds. To evaluate the properties of the joints, experimental tests were conducted including temperature measurement, tensile testing and microhardness measurements. The results confirmed the successful formation of dissimilar AISI 316L/AA 2017A joints through rotary friction welding and revealed a clear relationship between rotational speed and joint properties. Mechanical performance was significantly affected by changes in rotational speed, while thermal analysis provided insights into how maximum temperatures reached during welding are related to the resulting mechanical properties of the joints.

Keywords: *Rotational friction welding; Rotational speed; Stainless steel; Aluminum alloys; Mechanical properties.*