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ANALYSIS OF TENSILE AND MICROSTRUCTURAL PROPERTIES OF Al-Ni JOINTS BY ULTRASONIC SPOT WELDING.

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ABSTRACT

Ultrasonic metal spot welding (USMW) is a well-known solid-state joining process for bonding non-ferrousmetals without using any filler materials. The joining of dissimilar materials such as aluminum, nickel, copper, magnesium is difficult by fusion welding processes due to its higher thermal, chemical and physical properties. However, USMW yields better quality of joints under the influence of optimal parametric conditions. The flexibility of using this method is still restricted because of insufficient scientific understanding and unwanted intermetallic compound formation in the weld region. The current study is focused on the weld strength and failure behavior of ultrasonic spot-welded aluminum (AA1100) and pure nickel joints at different weld parametric conditions i.e. weld time, weld pressure and vibration amplitude. From the mechanical analysis, the tensile shear failure load of the welded specimen is highest at the maximum vibration amplitude with a balanced amount of weld pressure and weld time. It is also noticed that these joint strengths decreased with the further increase of weld time or weld pressure because of excessive interface temperature rise. It results in softening of the base material and more amount of interfacial diffusion occurred at the weld region. The microstructural morphologies at the weld region disclose various types of weld characteristics such as mechanical interlocking zone, wavy pattern region and swirling like diffusion area at the weld interface.

Keywords: Nickel, Aluminum, Ultrasonic metal spot welding, Tensile shear failure load, Microstructure, Intermetallic compounds