Mechanical properties of the micro resistance spot welding of aluminum alloy to stainless steel with a zinc interlayer

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All metals have unique advantages and disadvantages in terms of their mechanical properties. Advantages such as flexibility are needed for construction and for the manufacture of sophisticated products. Some industries have improved the mechanical properties of metals by welding dissimilar ones together, such as aluminum alloy (AA) to stainless steel (SS) to reduce vehicle weights in order to improve fuel consumption. However, little research has been conducted on using micro resistance spot welding (mRSW) to join SS and Al by inserting a zinc (Zn) sheet between them as an interlayer. In this study, the mechanical properties of the weldment are tested using a shear test and Vickers micro hardness test. The results are compared using welding times of 6, 8 and 10 cycle times (CTs) and welding currents of 5 and 8 kA during the mRSW process. It is found that the SS, Zn and AA sheets could be joined with mRSW using an 8 kAA welding current and a 6 CT welding time. The micro hardness in the AA-Zn dissimilar joint increased relative to SS-Zn. Using a Zn sheet also improved displacement in the tensile shear test; however, it also increased the hardness of the diffusion zone.