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Characterization of Microstructure and Mechanical Behaviour in Activated Tungsten Inert Gas Welded Dissimilar AA Joint of AA 5083 and AA 6061 Alloys

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Abstract

Aluminium alloys have a wide range of use in the manufacturing industries. Fusion welding procedures frequently use metal inert gas and tungsten inert gas (TIG) welding to combine aluminium alloys (AA).Overdue to AA's high expansion coefficient, high thermal conductivity and high electrical conductivity, it is more challenging to weld AA than steel. The capacity of TIG welding thick structures cannot be welded in one pass. Activated TIG (A-TIG), a novel development in TIG welding, has been created. With this technique, a single pass results in an ultra-deep penetration. The A-TIG welding procedure for combining AA 6061 and AA 5083 is described in this publication. The varied welding parameters' effects such as welding current, flux and filler rod for improving hardness have also been explored. Compared to conventional TIG welding, the TiO2 flux used in A-TIG welding enhanced the depth of penetration DOP and lowered the bead width. The TiO2 flux significantly improved weld hardness and reduced bead width. EDS and SEM analysis revealed changes in alloy composition and microstructure. This study successfully established dissimilar joints between AA 6061 and 5083 using A-TIG welding, with enhanced DOP and mechanical properties. The TiO2 flux played a vital role in altering surface tension and improving weld characteristics. The findings contribute to the understanding of A-TIG welding of dissimilar alloys, specifically AA 6061 and 5083.

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