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Effect of Overlap Orientation on Fatigue Behavior in Friction Stir Linear Welds of Magnesium Alloy Sheets.

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Abstract

In this work, we investigate the effect of sheet stacking orientation on fatigue behavior in friction stir linear welding of AZ31 Mg alloy. It is well known that during friction stir welding, that the advancing and retreating flow of the material generated by the tool creates asymmetrical weld features resulting is anisotropic mechanical behavior. As such, friction stir welding of overlap joints was carried out on 2mm thick sheets, where the orientation of the pull direction of the coupon was varied with respect to the tool rotation direction. Subsequently experimental fatigue tests were performed to evaluate this effect of the sheet stacking orientation on cyclic behavior. The fatigue results showed that the overlap joints loaded on the retreating side exhibited superior performance compared to the advancing side. Post-mortem analysis coupled with finite element results suggest that the geometrical shape of the faying surface produced by the advancing and retreating material flow largely determines the number of cycles to failure in these friction stir linear welded overlap joints.