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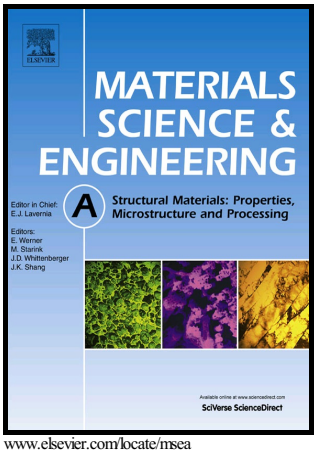

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Improving joint performance of friction stir welded wrought Mg alloy by controlling non-uniform deformation behavior

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Abstract

Macroscopic non-uniform deformation is usually found in deformed joints of friction sir welded (FSW) wrought Mg alloys, detrimental to the joint performance. In the present work, two kinds of FSW joints with different stirred zone (SZ) structures were generated for extruded AZ31 plates. Comparative studies were conducted aiming to unravel the underline mechanism of the non-uniform deformation and their effect on tensile properties. It was found that the occurrence of non-uniform deformation was associated with the special texture distribution and twinning behavior in the SZ. The shape of concave sub-regions in the SZ coincided with the distribution area of extension twins. Texture evolution showed that consistent lattice rotation occurred across the SZ during tensile process. Schmid factor analysis revealed the role acted by basal slip and extension twinning in sub-regions at various deformation stages. In addition, the non-uniform deformation behavior could be suppressed by modifying the texture distribution through increasing the tool rotation rate, which meanwhile could improve both the tensile strength and ductility of the joints. Digital image

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