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Evolution of local texture and its effect on mechanical properties and fracture behavior of friction stir welded joint of extruded Mg-3Al-1Zn alloy

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Abstract: For the wrought Mg alloys, the strong texture may greatly affect their fracture behavior and mechanical property. In the present study, a single plate of extruded AZ31 alloy was subjected to friction stir welding at different tilt angles relative to the extrusion direction, with the aim to investigate the evolution of local texture in the weld as well as its effect on the mechanical behavior of the joint. The results showed that the formation of specific-textured nugget zone and prevalent twinning activated at low strain brought about the reduction of yield anisotropy in the tensile test. Relatively higher elongation of the joints was achieved with the welding direction aligned at 45° to the extrusion direction. The fracture locations were observed to occur in different regions and shift with the variation of the welding direction, which was mainly attributed to the strain localization induced by incompatible deformation of different sub-regions. EBSD analyses indicated that the microstructure and texture evolution in both the nugget zone and the thermo-mechanically affected zone played a vital role in the inconsistent deformation behavior.

Keywords: EBSD; magnesium alloy; welding; mechanical property; texture; fracture

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