

Residual Stresses and Crystallographic Texture of Magnesium AZ31-C Alloy Welded by Friction Stir Welding (FSW)

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Abstract : The objective of the study was to characterize the properties of a magnesium alloy welded by friction stir welding (FSW). The results led to a better understanding of the relationship between this process, the microstructure and anisotropic properties of alloy materials. Welding principally leads to a large reduction in grain size in welded zones due to the phenomenon of dynamic recrystallization. The most remarkable observation was that crystallographic textures changed from a base metal with one texture in two zones: the thermo-mechanically affected and stir welded zones. The latter zone has the peculiarity of possessing a marked texture with two components on the basal plane and the pyramidal plane. These characteristics disappeared in the TMAZ, which had only one component following the basal plane. These modifications have been explained by the nature of the plastic deformation in these zones, which occurs at a moderate temperature in the TMAZ and high temperature in the SWZ. In the same time, we compared this evolution with the nature and the level of the residual stresses obtained by X-ray diffraction.

Keywords : texture crystallography, residual stresses, FSW process

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