EBSD ANALYSIS OF AA7075-T6 THIN SHEETS BUTT JOINTS OBTAINED BY IMPLUSE FRICTION STIR WELDING

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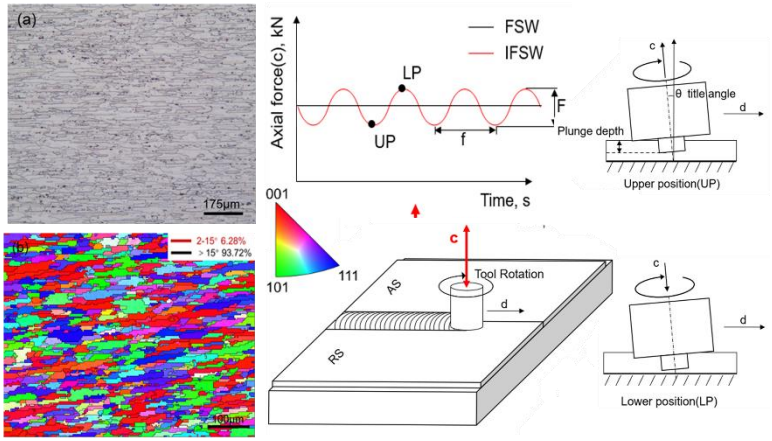
Abstract

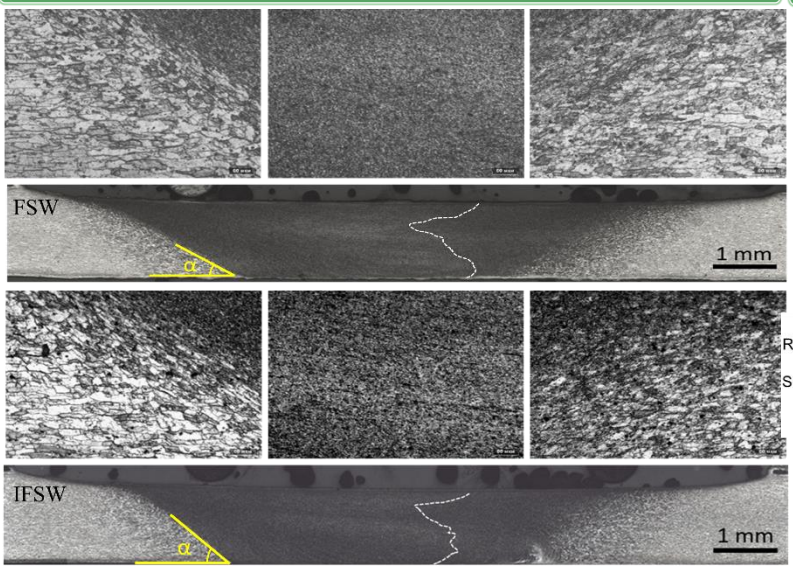
The microstructure characteristics of different zones in 7075-T6 aluminum alloy (AlZnMgCu1.5) joints produced by impulse friction stir welding (IFSW) and conventional friction stir welding (FSW) were investigated by means of electron backscatter diffraction (EBSD) analysis. A fine-grained equiaxed microstructure was formed in the stir zones (SZ) of the joints. The grain size range of SZ-IFSW is 5.78~22.74 μm, the grain size range of SZ-FSW is 6.04~27.54 μm. The additional plastic deformation caused by the impulses is beneficial to grain refinement. The distribution ratios of low-angle grain boundaries (LAGBs) and high-angle grain boundaries (HAGBs) in the SZ of the studied joints were calculated. The addition of impulses promotes continuous dynamic recrystallization in SZ, which allows the LAGBs to transform into HAGBs more effectively. The SZ and thermo-mechanically affected zone (TMAZ) of IFSW become wider under the additional plastic deformation. The results of microhardness distribution and tensile tests are presented and analyzed.

Material and Method

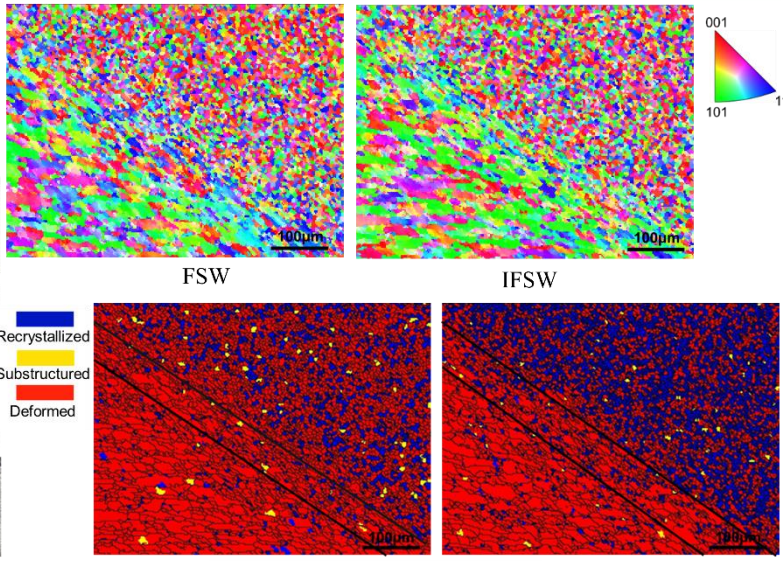


	Traverse speed V, mm/min	Rotational speed N, rpm	Axial force F_z, kN	Impulse frequency ν, Hz	Impulse force ΔF_z, kN
FSW	100	700	4.5	-	-
IFSW	100	700	4.5	6	6

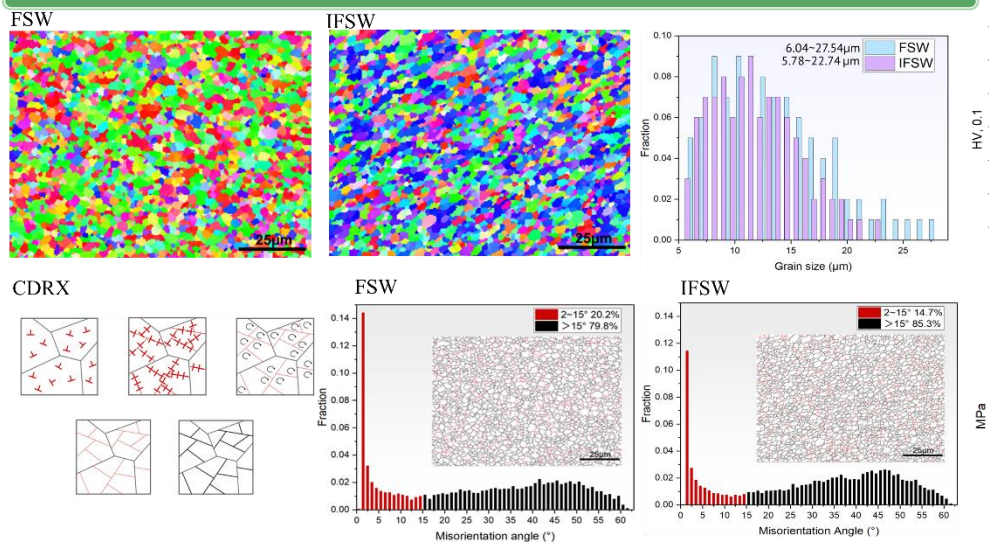
Macrostructure



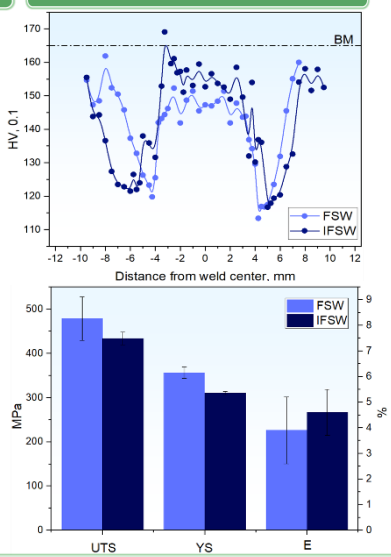
Transition Zone



Transition Zone



Mechanical Properties



Conclusions

The additional plastic deformation caused by the impulses promotes danamic recrystallization and grain refinement

The additional plastic deformation caused by IFSW widens the SZ and TMAZ