

## Friction Stir Processing of the AA7075T7352 Aluminum Alloy Microstructures Mechanical Properties and Texture Characteristics

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**Abstract :** Present work describes microstructures, mechanical properties, and texture characteristics of the friction stir processed AA7075T7352 aluminum alloy. Phases were analyzed with the help of x-ray diffractometer (XRD), transmission electron microscope (TEM) along with the differential scanning calorimeter (DSC). Depth-wise microstructures and dislocation characteristics from the nugget-zone of the friction stir processed specimens were studied using the bright field (BF) and weak beam dark-field (WBDF) TEM micrographs, and variation in the microstructures as well as dislocation characteristics were the noteworthy features found. XRD analysis display changes in the chemistry as well as size of the phases in the nugget and heat affected zones (Nugget and HAZ). Whereas the base metal (BM) microstructures remain un-affected. High density dislocations were noticed in the nugget regions of the processed specimen, along with the formation of dislocation contours and tangles. The  $\eta'$  and  $\eta$  phases, along with the GP-Zones were completely dissolved and trapped by the dislocations. Such an observations got corroborated to the improved mechanical as well as stress corrosion cracking (SCC) performances. Bulk texture and residual stress measurements were done by the Panalytical Empyrean MRD system with  $\text{Co-}\alpha$  radiation. Nugget zone (NZ) display compressive residual stress as compared to thermo-mechanically(TM) and heat affected zones (HAZ). Typical f.c.c. deformation texture components (e.g. Copper, Brass, and Goss) were seen. Such a phenomenon is attributed to the enhanced hardening as well as other mechanical performance of the alloy. Mechanical characterizations were done using the tensile test and Anton Paar Instrumented Micro Hardness tester. Enhancement in the yield strength value is reported from the 89MPa to the 170MPa; on the other hand, highest hardness value was reported in the nugget-zone of the processed specimens.

**Keywords :** aluminum alloy, mechanical characterization, texture characteristics, friction stir processing

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