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Fatigue Behaviour and Mechanical Properties of ECAP'ed and Thixoformed AA7075

Abstract: In this study, the effects of thixoforming, both equal channel angular pressing (ECAP) and thixoforming on high cycle fatigue and fatigue surface morphology of AA7075 have been examined. Experiments are carried out with the same sample materials (AA7075) at a constant temperature (483 K) and the “C” route for 4 passes at ECAP process. In the process of thixoforming is 20 min at 888 K for waiting and 1 min at 673 K for pressing implemented. 140 MPa, 120 MPa and 100 MPa strength values were used at fatigue tests. The microstructural characterizations of the samples were carried out by using optical microscope (OM), scanning electron microscope (SEM) and transmission electron microscope (TEM). This study is an attempt in detail to transformation fine and spherical grain structure with thixoforming process of minimized grain structure by ECAP. As a result of this study, it was seen that ECAP (1 pass) + semi-solid processing (SSP) applied samples have the highest hardness value (171 HV). When the values that are obtained after fatigue strength analyzed, SSP applied materials' property gave the best results and ECAP (1 pass) + SSP applied samples' results were second. When the both process applied materials' optimum values are investigated, it was observed that ECAP 1 pass + SSP applied material is more appropriate in terms of high hardness and fatigue life.

Keywords: equal channel angular pressing, thixoforming, AA7075, fatigue behavior, mechanical properties, microstructures