

Achieving Superplasticity in Fine-Grained Al-Mg-Sc Alloys

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Abstract. Superplasticity denotes the ability of a limited number of materials to achieve exceptionally high tensile elongations of at least 400%. Experiments show that the Al-Mg-Sc alloys provide excellent capabilities for achieving superplastic flow and also they can be formed easily in biaxial superplastic forming operations. It is important, therefore, to examine the superplastic flow mechanism when the alloy is prepared using different procedures. This report examines the superplastic characteristics of these alloys after preparation without subjecting to any severe plastic deformation (SPD), after processing using the two SPD procedures of equal-channel angular pressing (ECAP) and high-pressure torsion (HPT) and after processing using the alternative procedure of friction stir processing (FSP). The results are compared using each technique and they are examined with reference to a theoretical model that was developed specifically for superplastic flow in conventional alloys.