Grain Refinement in Al-Mn-Fe-Si Alloys by Severe Plastic Deformation

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Aluminium alloys are widely used materials and their properties are constantly being improved. The enhanced properties can be achieved, for instance by alternation of chemical composition or processing route. Severe plastic deformation leads to an increase of strength due to a grain size reduction. Two Al-Mn-Fe-Si alloys differing in Zr content were subjected to four passes of equal channel angular pressing. Grain size was re-duced from 100 μm to 0.5 μm. In the course of subsequent annealing to 400 ◦C the grain size rose moderate-ly; at 450 °C both materials recrystallized and new defect free grains were formed; with fraction of high angle grain boundaries nearly 1. The recrystallized grain size was comparable with the grain size after cast-ing. Moreover, high density of α-Al(Mn,Fe)Si particles precipitated during annealing in both alloys.

Keywords: Aluminium alloys, Twin-roll casting, Equal-channel angular pressing, Scanning electron microscopy, Electron back-scatter diffraction

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