

On the evolution of microstructure, texture and corrosion behavior of a hot-rolled and annealed AZ31 alloy

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Abstract: The microstructure and texture evolution of an AZ31 alloy were investigated after hot rolling and subsequent annealing using electron backscatter diffraction (EBSD). First, the alloy was hot-rolled at 350 °C up to low, medium and high strain (20, 50 and 85% of thickness reduction, respectively). The alloy samples were then annealed at 350 °C for 2, 10 and 60 min. The effect of strain level and annealing on corrosion behavior in seawater was also evaluated using electrochemical tests. At low strain, the microstructure was characterised by the absence of twinning, mainly due to the prior thermo-mechanical history of the as-received alloy. However, various modes of twinning were observed at medium strain. At high strain, the dynamic recrystallization process resulted in a microstructure with a typical basal texture. The results demonstrate that twins are responsible for the deviation of {0002} basal poles from normal towards the transversal direction. Annealing at 350 °C for up to 60 min led to normal grain growth in all the samples. In medium and highly strained samples, the deformation texture was retained, while the low strain sample underwent noticeable changes due to the absence of dynamic recrystallization. A synergetic effect of grain refinement and texture weakening was responsible for the alloy's enhanced corrosion resistance. AZ31 alloy Corrosion Dynamic recrystallization Static recrystallization Rolling

Keywords : AZ31 alloy, corrosion, Dynamic recrystallization, Static recrystallisation, rolling