

Effect of grain boundary misorientation on discontinuous precipitation in an AZ91 alloy

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Abstract

A scanning electron microscopy (SEM)-based electron backscatter diffraction (EBSD) analysis showed that the discontinuous precipitation (DP) reaction rate was dependent on the geometry of the grain boundary in Mg-9Al-1Zn (wt.%) alloys. DP converted a supersaturated solid solution, δ_0 (magnesium (Mg)-rich solid solution), into a two-phase $\delta + \gamma$ aggregate, with δ being a precipitated Mg₁₇Al₁₂ (intermetallic phase) behind a migrating reaction front. The near-special grain boundary was rather inactive, whereas most of the random high-angle boundaries promoted the reaction. Prior deformation (hot rolling to achieve up to 80% thickness reduction) had no effect on the frequency of special-grain boundaries.

Keywords : AZ91 alloy ; precipitation ; kinetics ; GBCD ; EBSD

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