Mechanistic investigation on Ce addition in tuning recrystallization behavior and mechanical property of Mg alloy

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Abstract

Constructing textured bimodal grain structure, which usually leads to high strength-ductility synergy in Mg alloy, is closely related to the dynamic recrystallization process. However, the mechanism has not been fully understood in the typical Mg-RE based alloy. In this work, it is for the first time claimed that the minor Ce addition into Mg matrix significantly promotes the pyramidal II-type and non-basal slipping at the early stage of extrusion. The fine sub-grain lamellae are thus predominantly observed due to the low migration rate of sub-grain boundary caused by the limited mobility of dislocations. At the later stage, some high angular grain boundary (HAGB) segregations are observed, which further contribute to formation of bimodal microstructure and also resultant high strength of 352 MPa. This work clarifies the critical role of Ce addition in tuning recrystallization behavior, and can shed light on designing the other high-performance Mg alloys.

Keywords: Mg alloys, Recrystallization behavior, Mechanical property, Pyramidal dislocation, Texture

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