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Abstract:

1 wt.% Zn addition introduced additional basal γ′ precipitates to the Mg-15Gd-0.4Zr (wt.%) alloy. Based on the detailed analysis of the precipitates and tensile properties evolution of the alloys, the composite β′ and γ′ precipitates provided a much stronger strengthening effect than the only β′ precipitates, even when the latter one had higher number density. The results imply that even a few γ′ precipitates can introduce a composite strengthening effect with the β′ precipitates. Meanwhile, the composite β′ and γ′ precipitates effectively strengthened the grain interior and hindered the twining during the tensile tests. Finally, the alloy containing the composite precipitates exhibited yield strength (YS) of 288MPa and ultimate tensile strength (UTS) of 403 MPa which were only 232 MPa and 296 MPa, respectively, in the alloy containing only β′ precipitates.

Keywords: Mg-Gd-Zn-Zr alloy; Composite β′ and γ′ precipitates; Precipitation strengthening; Mechanical properties

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